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State of New Jersey
REPORT
COMMISSIONER
OF
PUBLIC ROADS
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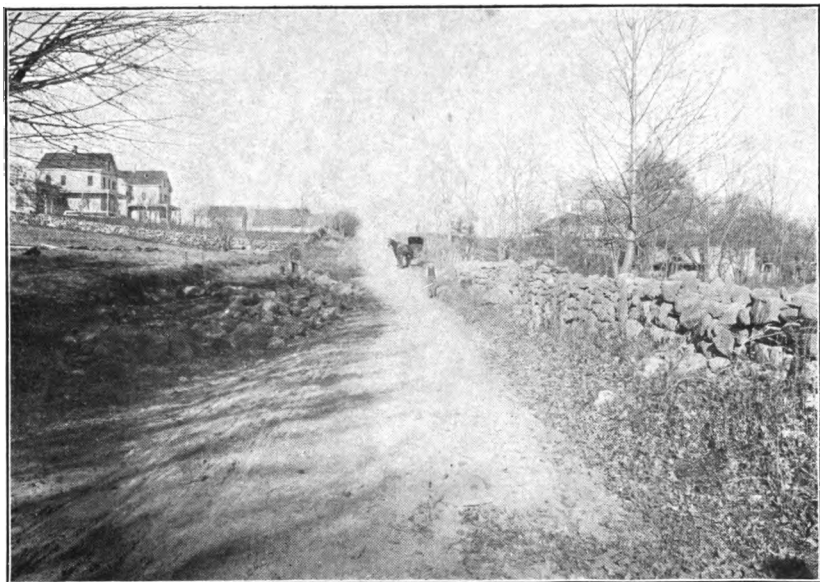
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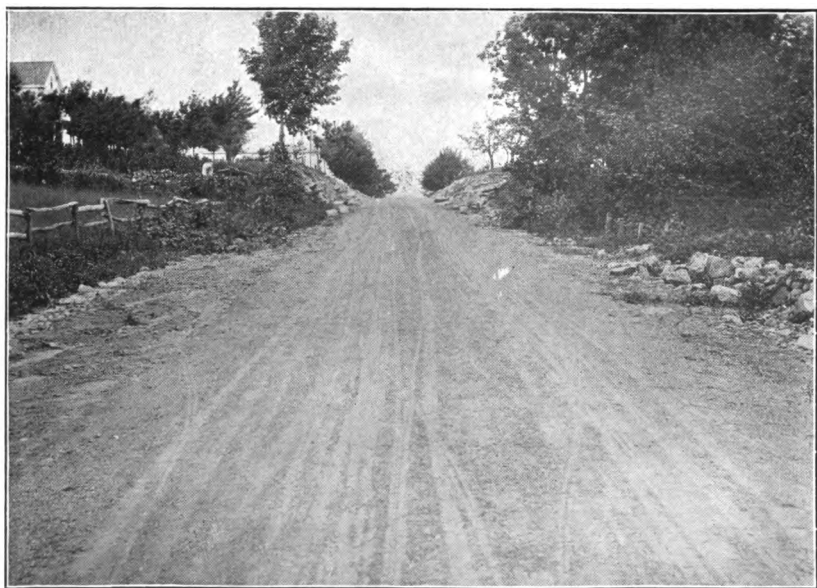
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it may determine.



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GRATIS



Echo Lake and West Milford road, near Baptist Church, Upper Macopin, Passaic County, looking north, before improvement.



Echo Lake and West Milford road, near Baptist Church, Upper Macopin, Passaic County, looking north, after improvement.

EIGHTH ANNUAL REPORT

| | | |
|---------|------------|--------|
| SECTION | SUBSECTION | FILE |
| 4 | - | 38.6-8 |

OF THE

Commissioner of Public Roads

FOR THE YEAR ENDING OCTOBER 31ST,

Compliments of

HENRY I. BUDD,

State Commissioner of Public Roads.

If you desire future reports, please acknowledge receipt.

TRENTON, N. J.

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QUARTS

OFFICE OF COMMISSIONER OF PUBLIC ROADS
TRENTON, NEW JERSEY, November 30th, 1901.

To His Excellency Foster M. Voorhees, Governor, and the Legislature of New Jersey:

As required by the State Aid Road law, I have the honor to submit the Eighth Annual Report of the Commissioner of Public Roads for the fiscal year ending October 31st, 1901, with such comments, quotations and suggestions as existing circumstances seem to require.

HENRY I. BUDD,
Commissioner of Public Roads.

(3)



Cannon-ball road, Passaic County, during improvement.



Cannon-ball road, Passaic County, after improvement, covered with fallen leaves.
Four-inch Macadam.

REPORT.

In compliance with the act of March 22d, 1895, we make a statement of cost of roads that will claim this year's appropriation, as indicated by the figures below:

COST OF ROADS.

ATLANTIC COUNTY.

| | | |
|-------------------------------------|-------------|-------------|
| Egg Harbor and Green Bank road..... | | 7.03 miles. |
| Cost | \$11,034 17 | |
| State's share | 3,434 07 | |
| Total number of miles..... | | 7.03 |
| Total paid the County..... | | \$3,434 07 |

BURLINGTON COUNTY.

| | | |
|--|-------------|-------------|
| Hutton road..... | | 1 mile. |
| Cost | \$5,382 60 | |
| State's share..... | 1,675 18 | |
| High street, Burlington..... | | .50 miles. |
| Cost | \$4,150 00 | |
| State's share..... | 1,291 56 | |
| Mount Holly and Jacksonville road..... | | 3.60 miles. |
| Cost | \$17,743 25 | |
| State's share..... | 5,522 08 | |
| Batsto and Wading River road..... | | 9.79 miles. |
| Cost | \$14,451 93 | |
| State's share..... | 4,497 75 | |
| Stokes road..... | | 2.47 miles. |
| Cost | \$3,917 95 | |
| State's share..... | 1,219 34 | |
| Total number of miles..... | | 17.36 |
| Total paid the County..... | | \$14,205 91 |

CAMDEN COUNTY.

| | | |
|------------------------------------|-------------|-------------|
| Haddonfield and Magnolia road..... | | 2.35 miles. |
| Cost | \$14,791 45 | |
| State's share..... | 4,603 41 | |
| Ashland road..... | | 2.13 miles. |
| Cost | \$15,041 28 | |
| State's share..... | 4,681 16 | |
| Total number of miles..... | | 4.48 |
| Total paid the County..... | | \$9,284 57 |

EIGHTH ANNUAL REPORT.

CAPE MAY COUNTY.

| | | |
|----------------------------|-------------|------------|
| Seashore road..... | | 6 miles. |
| Cost | \$19,193 68 | |
| State's share..... | 5,973 48 | |
| Total number of miles..... | | 6 miles. |
| Total paid the County..... | | \$5,973 48 |

ESSEX COUNTY.

| | | |
|---|-------------|-------------|
| East Passaic avenue and Kingsland road..... | | 2 miles. |
| Cost | \$17,125 77 | |
| State's share..... | 5,329 90 | |
| Eagle Rock road..... | | 4.54 miles. |
| Cost | \$32,105 51 | |
| State's share..... | 9,991 92 | |
| Parsonage Hill road..... | | 2.82 miles. |
| Cost | \$26,469 30 | |
| State's share..... | 8,237 81 | |
| Total number of miles..... | | 9.36 |
| Total paid the County..... | | \$23,559 63 |

GLOUCESTER COUNTY.

| | | |
|---------------------------------|-------------|-------------|
| Mullica Hill road..... | | 6.54 miles. |
| Cost | \$9,071 85 | |
| State's share..... | 2,823 35 | |
| Bridgeport road..... | | 6.02 miles. |
| Cost | \$22,387 28 | |
| State's share..... | 6,967 40 | |
| Glassboro and Clayton road..... | | 4.88 miles. |
| Cost | \$14,087 98 | |
| State's share..... | 4,384 47 | |
| Total number of miles..... | | 17.44 |
| Total paid the County..... | | \$14,175 22 |

MERCER COUNTY.

| | | |
|--|-------------|-------------|
| Hutchinson's Mill road..... | | 1.18 miles. |
| Cost | \$6,640 00 | |
| State's share..... | 2,066 50 | |
| Edinburgh, Windsor and Hightstown road..... | | 7.01 miles. |
| Cost | \$54,041 78 | |
| State's share..... | 16,818 96 | |
| Portion of Lower Ferry road (Township road)..... | | .52 miles. |
| Cost | \$2,145 60 | |
| State's share..... | 667 75 | |
| Portion of Upper Ferry road (Township road)..... | | 1.30 miles. |
| Cost | \$5,320 80 | |
| State's share..... | 1,655 95 | |
| Extension of Old York road..... | | .36 miles. |
| Cost | \$3,241 34 | |
| State's share..... | 1,008 80 | |
| Total number of miles..... | | 10.37 |
| Total paid the County..... | | \$22,217 96 |

COMMISSIONER OF PUBLIC ROADS.

7

MIDDLESEX COUNTY.

| | | |
|---|-------------|-------------|
| Portion of Manalapan road | | 1 mile. |
| Cost | \$6,729 51 | |
| State's share..... | 2,094 33 | |
| Carteret road | | .60 miles. |
| Cost | \$504 86 | |
| State's share..... | 157 13 | |
| Remainder of Second Section of Cranbury turnpike..... | | 3.12 miles. |
| Cost | \$27,902 50 | |
| State's share..... | 8,683 85 | |
| Cranbury and Hightstown road..... | | 1.40 miles. |
| Cost | \$11,547 44 | |
| State's share..... | 3,593 81 | |
| Total number of miles..... | | 6.12 |
| Total paid the County..... | | \$14,529 12 |

MONMOUTH COUNTY.

| | | |
|---|-------------|-------------|
| Keyport and Keansburg road..... | | 1.51 miles. |
| Cost | \$12,025 45 | |
| State's share..... | 3,742 57 | |
| Bergen's Mills road..... | | 1.94 miles. |
| Cost | \$10,997 50 | |
| State's share..... | 3,422 75 | |
| Second section of Lower Squankum and Turkey road..... | | 3.22 miles. |
| Cost | \$4,887 94 | |
| State's share..... | 1,521 23 | |
| Total number of miles..... | | 6.67 |
| Total paid the County..... | | \$8,686 55 |

MORRIS COUNTY.

| | | |
|-----------------------------------|-------------|-------------|
| Whippany and Parsippany road..... | | 3.78 miles. |
| Cost | \$19,641 08 | |
| State's share..... | 6,112 72 | |
| Brooklyn and Landing road..... | | .526 miles. |
| Cost | \$2,411 94 | |
| State's share..... | 750 65 | |
| Total number of miles..... | | 4.306 |
| Total paid the County..... | | \$6,863 37 |

PASSAIC COUNTY.

| | | |
|--------------------------------------|-------------|-------------|
| West Twenty-fifth street..... | | .227 miles. |
| Cost | \$622 05 | |
| State's share..... | 193 59 | |
| Echo Lake and West Milford road..... | | 2.66 miles. |
| Cost | \$13,892 35 | |
| State's share..... | 4,323 59 | |
| North Seventh street..... | | .32 miles. |
| Cost | \$1,111 32 | |
| State's share..... | 345 87 | |
| Cannon Ball road..... | | .78 miles. |
| Cost | \$2,443 06 | |
| State's share..... | 760 33 | |
| Total number of miles..... | | 3.987 |
| Total paid the County..... | | \$5,623 26 |

EIGHTH ANNUAL REPORT.

SOMERSET COUNTY.

| | | |
|----------------------------|-------------|-------------|
| Pluckamin road..... | | 7.93 miles. |
| Cost | \$29,121 38 | |
| State's share | 9,063 20 | |
| Total number of miles..... | | 7.93 |
| Total paid the County..... | | \$9,063 20 |

SUSSEX COUNTY.

| | | |
|----------------------------|------------|-------------|
| Lakeside boulevard | | .893 miles. |
| Cost | \$5,571 18 | |
| State's share | 1,733 87 | |
| Total number of miles..... | | .893 |
| Total paid the County..... | | \$1,733 87 |

WARREN COUNTY.

| | | |
|--|--------------|--------------|
| Allamuchy road | | 5.45 miles. |
| Cost | \$21,897 15 | |
| State's share | 6,814 86 | |
| Morris turnpike..... | | 1.98 miles. |
| Cost | \$11,839 82 | |
| State's share | 3,684 81 | |
| Total number of miles..... | | 7.43 |
| Total paid the County..... | | \$10,499 67 |
| Total number of miles..... | | 109.376 |
| Total cost to the State..... | \$149,850 00 | |
| Amount paid to Commissioners to appraise the Holmdel and Keyport Turnpike, Mon- mouth County | 150 00 | |
| Total | | \$150,000 00 |
| Appropriation | | 150,000 00 |

The following roads are approaching completion, but were not finished in time to receive the State's aid in 1901:

ATLANTIC COUNTY.

| | No. of Miles. | Cost. |
|--------------------------------------|---------------|-------------|
| Pleasantville and May's Landing..... | 12 | \$16,776 52 |

BURLINGTON COUNTY.

| | | |
|--------------------------------------|------|-----------|
| Mount Holly and Smithville road..... | 3.20 | 17,378 00 |
| Medford and Red Lion road..... | 4.50 | 17,748 12 |

CAMDEN COUNTY.

| | | |
|------------------|------|-----------|
| River road | 3.60 | 32,060 14 |
|------------------|------|-----------|

CAPE MAY COUNTY.

| | | |
|--------------------|------|----------|
| Asbury avenue..... | 1.80 | 3,631 80 |
|--------------------|------|----------|

MERCER COUNTY.

| | | |
|-------------------------------------|------|-----------|
| Trenton and Allentown Turnpike..... | 2.52 | 12,351 54 |
|-------------------------------------|------|-----------|

COMMISSIONER OF PUBLIC ROADS.

9

MIDDLESEX COUNTY.

| | No. of Miles. | Cost. |
|-----------------------|---------------|-----------|
| Manalapan road..... | 1.00 | 10,402 65 |
| South River road..... | 1.26 | 4,966 53 |

PASSAIC COUNTY.

| | | |
|-----------------------|------|----------|
| Naughtpunck road..... | 3.39 | 9,737 50 |
|-----------------------|------|----------|

WARREN COUNTY.

| | | |
|--|-------|--------------|
| Washington avenue, Belvidere avenue and Broad street | 1.43 | 8,569 16 |
| Total | 35.23 | \$133,621 96 |

Specifications for the following roads have been and are being prepared, some of which are under and are being placed under contract for construction, and will claim the State's appropriation for the fiscal year beginning November 1st, 1901, and ending October 31st, 1902:

ATLANTIC COUNTY.

| | Miles. | Est. Cost. |
|---------------------------|--------|-------------|
| Hammonton and Atsion..... | 7.50 | \$12,000 00 |

BURLINGTON COUNTY.

| | | |
|--------------------------------------|-------|-------------|
| Columbus and Burlington..... | 6.98 | \$35,000 00 |
| Piper's Corner and Indian Mills..... | 4 | 4,800 00 |
| | 10.98 | \$39,800 00 |

CAMDEN COUNTY.

| | | |
|------------------------------|------|------------|
| Gibbsboro and Clementon..... | 2 51 | \$5,000 00 |
|------------------------------|------|------------|

CAPE MAY COUNTY.

| | | |
|--|------|-------------|
| Cape May City to Cape May Court House..... | 6.18 | \$21,000 00 |
|--|------|-------------|

ESSEX COUNTY.

| | | |
|--------------------------------------|------|-------------|
| West Passaic avenue, Bloomfield..... | 1 | \$7,000 00 |
| Fifth avenue, Montclair..... | 1 | 8,500 00 |
| Ridge road, Verona..... | 1.75 | 14,000 00 |
| Sandford street, East Orange..... | 1 | 8,000 00 |
| Mountain road, Caldwell..... | 3 | 18,000 00 |
| | 7.75 | \$55,500 00 |

GLOUCESTER COUNTY.

| | | |
|--|-------|-------------|
| Delaware street..... | 1.68 | \$10,000 00 |
| German street | .10 | 600 00 |
| Glassboro and Hardingville (gravel)..... | 5.18 | 10,400 00 |
| Clayton and Williamston (gravel)..... | 5.96 | 12,000 00 |
| | 12.92 | \$33,000 00 |

EIGHTH ANNUAL REPORT.

MERCER COUNTY.

| | Miles. | Est. Cost. |
|---|------------|-------------------|
| Marshall's Corner to Woodsville..... | 2.43 | \$12,000 00 |
| Hamilton avenue | 3.25 | 16,000 00 |
| Allentown Turnpike, second section..... | 3.65 | 18,000 00 |
| | <hr/> 9.33 | <hr/> \$46,000 00 |

MONMOUTH COUNTY.

| | | |
|---|-------------|-------------------|
| Main street, Matawan (stone)..... | 1.50 | \$9,000 00 |
| Red Bank and Oceanic (stone)..... | 3.19 | 19,000 00 |
| Holmdel and Marlboro (stone)..... | 3.52 | 22,000 00 |
| Lower Squankum and Lakewood (gravel)..... | 4.71 | 9,500 00 |
| | <hr/> 12.92 | <hr/> \$59,500 00 |

MORRIS COUNTY.

| | | |
|--------------------------|-------------|-------------------|
| Passaic Valley road..... | 4.30 | \$22,000 00 |
| Mt. Freedom road..... | 6.07 | 42,500 00 |
| | <hr/> 10.37 | <hr/> \$64,500 00 |

. OCEAN COUNTY.

| | | |
|----------------------------------|----|-------------|
| Lakewood and Point Pleasant..... | 10 | \$25,000 00 |
|----------------------------------|----|-------------|

PASSAIC COUNTY.

| | | |
|--|--------------|-------------------|
| Clove road | .88 | \$4,500 00 |
| Squaw Brook road..... | 1.46 | 7,500 00 |
| Laurel street and Crosby avenue..... | .57 | 2,800 00 |
| Highland avenue | .81 | 4,000 00 |
| Hamburg Turnpike and Oakland road..... | 1.70 | 8,500 00 |
| Macopin road..... | 2.754 | 13,800 00 |
| Paterson and Hamburg Turnpike..... | 3.713 | 18,600 00 |
| Mountain View and Singac..... | 2.47 | 12,500 00 |
| | <hr/> 14.357 | <hr/> \$72,200 00 |

SALEM COUNTY.

| | | |
|---|------------|-------------------|
| Salem and Hancock's Bridge (shell)..... | 1.08 | \$2,600 00 |
| Pennsville and Salem (shell)..... | 5.87 | 14,100 00 |
| | <hr/> 6.95 | <hr/> \$16,700 00 |

SOMERSET COUNTY.

| | | |
|---|------------|-------------------|
| Rocky Hill to Kingston..... | 1.13 | \$7,000 00 |
| Liberty School House to Conover's Corner..... | 3.38 | 17,500 00 |
| Skillman road | 2.50 | 10,000 00 |
| | <hr/> 7.01 | <hr/> \$34,500 00 |

During the years 1893 and 1894 there was built in

| | |
|---|--------------|
| Middlesex county | 16.09 miles. |
| Mercer county | 12.78 " |
| Camden county | 14.50 " |
| Burlington county | 31.47 " |
| <hr/> | |
| Total number of miles built in 1893 and 1894..... | 74.84 |

During the year 1895 there was built in

| | |
|--|-------------|
| Burlington county | 9.75 miles. |
| Camden county..... | 8.25 " |
| Essex county..... | 6.50 " |
| Gloucester county..... | 7.75 " |
| Middlesex county..... | 7.62 " |
| Mercer county..... | 6.40 " |
| <hr/> | |
| Total number of miles built in 1895..... | 46.27 |

During the year 1896 there was built in

| | |
|--|--------------|
| Atlantic county..... | 12.00 miles. |
| Burlington county..... | 11.01 " |
| Essex county..... | 6. " |
| Gloucester county..... | 6. " |
| Mercer county..... | 10.95 " |
| Middlesex county..... | 9. " |
| Monmouth county..... | 3.75 " |
| Salem county..... | 2.67 " |
| <hr/> | |
| Total number of miles built in 1896..... | 61.38 |

During the year 1897 there was built in

| | |
|--|--------------|
| Atlantic county..... | 10.50 miles. |
| Burlington county..... | 10. " |
| Camden county..... | 4.12 " |
| Essex county..... | 5.00 " |
| Gloucester county..... | 5.50 " |
| Mercer county..... | 4.75 " |
| Middlesex county..... | 4.75 " |
| Morris county..... | 6.12 " |
| Monmouth county..... | 5. " |
| Passaic county..... | 4.75 " |
| Somerset county..... | 6.20 " |
| <hr/> | |
| Total number of miles built in 1897..... | 66.69 |

During the year 1898 there was built in

| | |
|------------------------|-------------|
| Atlantic county..... | 6.80 miles. |
| Burlington county..... | 14.91 " |
| Camden county..... | 12.80 " |
| Essex county..... | 9.60 " |
| Gloucester county..... | 7.60 " |
| Mercer county..... | 2.70 " |
| Middlesex county..... | 6.17 " |
| Monmouth county..... | 5.11 " |
| Morris county..... | 6.10 " |
| Passaic county..... | 5.88 " |
| Somerset county..... | 7.25 " |

| | |
|--|-------|
| Total number of miles built in 1898..... | 84.92 |
|--|-------|

During the year 1899 there was built in

| | |
|------------------------|-------------|
| Atlantic county..... | 3.82 miles. |
| Burlington county..... | 18.50 " |
| Camden county..... | 2.20 " |
| Essex county..... | 12.02 " |
| Gloucester county..... | 12.80 " |
| Mercer county..... | 10.92 " |
| Middlesex county..... | 13.87 " |
| Monmouth county..... | 15.06 " |
| Morris county..... | 8.00 " |
| Passaic county..... | 8.67 " |
| Salem county..... | 2.17 " |
| Somerset county..... | 6.60 " |
| Warren county..... | 0.09 " |

| | |
|--|--------|
| Total number of miles built in 1899..... | 114.72 |
|--|--------|

During the year 1900 there was built in

| | |
|------------------------|-------------|
| Burlington county..... | 8.93 miles. |
| Camden county..... | 1.00 " |
| Essex county..... | 9.60 " |
| Gloucester county..... | 9.08 " |
| Hudson county..... | 2.44 " |
| Mercer county..... | 9.16 " |
| Middlesex county..... | 9.01 " |
| Monmouth county..... | 8.28 " |
| Morris county..... | 6.53 " |
| Passaic county..... | 6.73 " |
| Salem county..... | 2.45 " |
| Somerset county..... | 6.65 " |
| Union county..... | 3.43 " |

| | |
|--|-------|
| Total number of miles built in 1900..... | 83.29 |
|--|-------|

During the year 1901 there was built in

| | |
|------------------------|-------------|
| Atlantic county..... | 7.03 miles. |
| Burlington county..... | 17.36 " |
| Camden county..... | 4.48 " |
| Cape May county..... | 6.00 " |
| Essex county..... | 9.36 " |
| Gloucester county..... | 17.44 " |
| Mercer county..... | 10.37 " |
| Middlesex county..... | 6.12 " |
| Monmouth county..... | 6.67 " |
| Morris county..... | 4.306 " |
| Passaic county..... | 3.987 " |
| Somerset county..... | 7.93 " |
| Sussex county..... | .893 " |
| Warren county..... | 7.43 " |

| | |
|--|---------|
| Total number of miles built in 1901..... | 109.376 |
|--|---------|

Names and lengths of the roads built in 1901.

ATLANTIC COUNTY.

| | |
|-------------------------------------|--------|
| | Miles. |
| Egg Harbor and Green Bank road..... | 7.03 |

BURLINGTON COUNTY.

| | |
|-----------------------------------|-------------|
| Hutton road..... | 1.00 |
| High street, Burlington..... | .50 |
| Mount Holly and Jacksonville..... | 3.60 |
| Batsto and Wading River..... | 9.79 |
| Stokes road..... | 2.47 |
| | <hr/> 17.36 |

CAMDEN COUNTY.

| | |
|------------------------------------|------------|
| Ashland road..... | 2.13 |
| Haddonfield and Magnolia road..... | 2.35 |
| | <hr/> 4.48 |

CAPE MAY COUNTY.

| | |
|--------------------|------|
| Seashore road..... | 6.00 |
|--------------------|------|

ESSEX COUNTY.

| | |
|---|------------|
| Parsonage Hill road..... | 2.82 |
| Eagle Rock road..... | 4.54 |
| East Passaic avenue and Kingsland road..... | 2.00 |
| | <hr/> 9.36 |

GLOUCESTER COUNTY.

| | |
|---------------------------------|-------------|
| Mullica Hill road..... | 6.54 |
| Bridgeport road..... | 6.02 |
| Clayton and Glassboro road..... | 4.88 |
| | <hr/> 17.44 |

MERCER COUNTY.

| | Miles. | |
|---|--------|-------|
| Hutchinson's Mill road..... | 1.18 | |
| Edinburgh, Windsor and Hightstown road..... | 7.01 | |
| Extension of Old York road..... | .36 | |
| Portion of Lower Ferry, Township road..... | .52 | |
| Portion of Upper Ferry, Township road..... | 1.30 | |
| | <hr/> | 10.37 |

MIDDLESEX COUNTY.

| | | |
|---|-------|------|
| Carteret road..... | .60 | |
| Remainder of Second Section of Cranbury Turnpike..... | 3.12 | |
| Portion of Manalapan road..... | 1.00 | |
| Cranbury and Hightstown road..... | 1.40 | |
| | <hr/> | 6.12 |

MONMOUTH COUNTY.

| | | |
|---|-------|------|
| Second Section of Lower Squankum and Turkey road..... | 3.22 | |
| Bergen's Mills road..... | 1.94 | |
| Keyport and Keansburg road..... | 1.51 | |
| | <hr/> | 6.67 |

MORRIS COUNTY.

| | | |
|-----------------------------------|-------|-------|
| Whippany and Parsippany road..... | 3.78 | |
| Brooklyn and Landing road..... | .526 | |
| | <hr/> | 4.306 |

PASSAIC COUNTY.

| | | |
|--------------------------------------|-------|-------|
| Echo Lake and West Milford road..... | 2.66 | |
| North Seventh street..... | .32 | |
| West Twenty-fifth street..... | .227 | |
| Cannon Ball road..... | .78 | |
| | <hr/> | 3.987 |

SOMERSET COUNTY.

| | | |
|---------------------|------|--|
| Pluckamin road..... | 7.93 | |
|---------------------|------|--|

SUSSEX COUNTY.

| | | |
|-------------------------|------|--|
| Lakeside Boulevard..... | .893 | |
|-------------------------|------|--|

WARREN COUNTY.

| | | |
|----------------------|-------|------|
| Allamuchy road..... | 5.45 | |
| Morris Turnpike..... | 1.98 | |
| | <hr/> | 7.43 |

| | |
|----------------------------|---------|
| Total number of miles..... | 109.376 |
|----------------------------|---------|

During the year 1901 there was built in

| | No. of miles paid for. | No. of miles net paid for. | Total No. of miles. |
|------------------------|------------------------------|----------------------------------|---------------------------|
| Atlantic county..... | 7.03 | 12 | 19.03 |
| Burlington county..... | 17.36 | 7.70 | 25.06 |
| Camden county..... | 4.48 | 3.60 | 8.08 |
| Cape May county..... | 6.00 | 1.80 | 7.80 |
| Essex county..... | 9.36 | ..... | 9.36 |
| Gloucester county..... | 17.44 | ..... | 17.44 |
| Mercer county..... | 10.37 | 2.52 | 12.89 |
| Middlesex county..... | 6.12 | 2.26 | 8.38 |
| Monmouth county..... | 6.67 | ..... | 6.67 |
| Morris county..... | 4.306 | ..... | 4.306 |
| Passaic county..... | 3.987 | 3.39 | 7.377 |
| Somerset county..... | 7.93 | ..... | 7.93 |
| Sussex county..... | .893 | ..... | .893 |
| Warren county..... | 7.43 | 1.43 | 8.86 |
| Total..... | 109.376 | 35.23 | 144.606 |

The total amount expended by the State and the number of miles built in each county since the passage of the State Aid Law, are as follows:

| County. | Miles. | Amount. |
|------------------|---------|----------------|
| Atlantic | 40.15 | \$24,315 78 |
| Burlington | 121.93 | 187,791 51 |
| Camden | 47.35 | 89,999 43 |
| Cape May | 6.00 | 5,973 48 |
| Essex | 58.08 | 116,980 33 |
| Gloucester | 66.17 | 74,768 27 |
| Hudson | 2.44 | 8,944 60 |
| Mercer | 68.03 | 163,604 75 |
| Middlesex | 72.63 | 128,726 57 |
| Monmouth | 43.87 | 57,060 17 |
| Morris | 31.056 | 45,902 42 |
| Passaic | 30.017 | 41,617 57 |
| Salem | 7.29 | 4,750 74 |
| Somerset | 34.63 | 47,993 37 |
| Sussex | .893 | 1,733 87 |
| Union | 3.43 | 4,319 35 |
| Warren | 7.52 | 10,686 34 |
| Total..... | 641.486 | \$1,015,168 55 |

AMOUNT AVAILABLE FOR ROAD BUILDING IN EACH COUNTY.

Under the State Aid Law the estimated cost of all improvements made under this act, together with the estimated cost of repairs of roads already constructed, in any county in any one year, shall not exceed one-fourth of one per centum of the ratables of such county for the last preceding year.

The following table will show at a glance the limitations of expenditures in each county, also the amount that can be expended, provided the State appropriation is liberal enough to meet it. For example: Atlantic county, with ratables amounting to \$26,829,008, could expend per year, if State appropriation were sufficient, \$67,072.52; a rate, if applied to all the counties, even with the cost of repairs to roads already built deducted, would, in a few years, cover all our leading roads with stone and gravel:

| County. | Abstract of Ratables for 1901. | One-fourth of one per cent. |
|------------------|--------------------------------|-----------------------------|
| Atlantic | \$26,829,008 00 | \$67,072 52 |
| Bergen | 42,235,091 00 | 105,587 73 |
| Burlington | 22,178,366 00 | 55,445 91 |
| Camden | 40,066,241 00 | 100,165 60 |
| Cape May | 8,140,000 00 | 20,350 00 |
| Cumberland | 17,083,000 00 | 42,707 50 |
| Essex | 222,157,000 00 | 555,392 50 |
| Gloucester | 14,534,953 00 | 36,337 38 |
| Hudson | 172,928,511 00 | 432,321 28 |
| Hunterdon | 17,711,592 00 | 44,278 98 |
| Mercer | 47,363,488 00 | 118,408 72 |
| Middlesex | 28,623,988 00 | 71,559 97 |
| Monmouth | 49,375,953 00 | 123,439 88 |
| Morris | 28,294,016 00 | 70,735 04 |
| Ocean | 8,870,650 50 | 22,176 63 |
| Passaic | 66,894,337 00 | 167,235 84 |
| Salem | 13,906,959 00 | 34,767 39 |
| Somerset | 18,788,468 00 | 46,971 17 |
| Sussex | 11,672,863 00 | 29,182 16 |
| Union | 42,775,400 00 | 106,938 50 |
| Warren | 17,988,857 00 | 44,972 14 |

The following roads have been and are being petitioned for, to be improved under the State Aid act:

| ATLANTIC COUNTY. | | |
|---|--------|-------------|
| | Miles. | Est. Cost. |
| May's Landing and Pleasantville—gravel..... | 12 | \$12,000 00 |
| May's Landing and Tuckahoe—gravel..... | 11 | 11,000 00 |
| | 23 | \$23,000 00 |
| BERGEN COUNTY. | | |
| Cherry Run—stone..... | 1.75 | \$9,000 00 |

COMMISSIONER OF PUBLIC ROADS.

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BURLINGTON COUNTY.

| | Miles. | Est. Cost. |
|--|--------|--------------|
| Masonville and Coates corner—stone..... | 3.51 | \$17,000 00 |
| Cross Roads and Green Tree—stone..... | 2.50 | 12,000 00 |
| Green Tree Pike—stone..... | 2.00 | 10,000 00 |
| Red Lion and Tabernacle—stone..... | 4.00 | 20,000 00 |
| Indian Mills, Atsion and Batsto—gravel..... | 9.50 | 19,000 00 |
| Pemberton and Wrightstown—stone..... | 6.00 | 30,000 00 |
| Burlington and Jacksonville—stone..... | 6.00 | 30,000 00 |
| Burlington and Beverly—stone..... | 3.00 | 15,000 00 |
| Rancocas and Burlington—stone..... | 4.00 | 20,000 00 |
| Rancocas and Beverly—stone..... | 5.00 | 25,000 00 |
| Recklesstown and Mansfield—stone..... | 1.60 | 8,000 00 |
| Ballenger's Mills and Tabernacle—gravel..... | 4.00 | 6,000 00 |
| Ward avenue, Crosswicks—stone..... | 3.50 | 18,000 00 |
| Medford and Wilkins streets—stone..... | 1.50 | 7,000 00 |
| Wrightstown and Rising Sun—stone..... | 7.00 | 35,000 00 |
| Keeler's Corner and Jacksonville—stone..... | 2.00 | 10,000 00 |
| Tabernacle and Chatsworth—gravel..... | 10.50 | 21,000 00 |
| Hartford to Bridgeboro—stone..... | 3.30 | 16,000 00 |
| Bordentown and Groveville—stone..... | 3 00 | 15,000 00 |
| Auback and Groveville Bridge—stone..... | 2.00 | 10,000 00 |
| Georgetown and Wrightstown—stone..... | 4.00 | 20,000 00 |
| Bordentown and Florence—stone..... | 5.00 | 25,000 00 |
| Florence Station to Burlington City Line—stone.... | 4.00 | 20,000 00 |
| Bordentown and Crosswicks—stone..... | 4.00 | 20,000 00 |
| Bordentown and Chesterfield—stone..... | 6.00 | 30,000 00 |
| Mount Laurel and Hainesport—stone..... | 7.00 | 35,000 00 |
| New Egypt and Chatsworth—gravel..... | 12.00 | 24,000 00 |
| | 131.90 | \$598,000 00 |

CAMDEN COUNTY.

| | | |
|---|-------|-------------|
| Heading and Lawnside—stone..... | 2.50 | \$15,000 00 |
| Sicklertown to Chew's Landing—gravel..... | 8.00 | 9,600 00 |
| Gibbsboro and Clementon—gravel..... | 2.60 | 5,000 00 |
| | 13.10 | \$29,600 00 |

CAPE MAY COUNTY.

| | | |
|---|------|-------------|
| Cape May to Cape May Court House, second section —gravel | 6.18 | \$18,000 00 |
|---|------|-------------|

ESSEX COUNTY.

| | Miles. | Est. Cost. |
|--|--------|-------------|
| West Passaic avenue, Bloomfield—stone..... | 1.00 | \$7,000 00 |
| Fifth avenue, Montclair—stone..... | 1.00 | 8,500 00 |
| Ridge road, Township of Verona—stone..... | 1.75 | 14,000 00 |
| Sandford street, Township of East Orange—stone.... | 1.00 | 8,000 00 |
| Mountain road, Township of Caldwell—stone..... | 3.00 | 18,000 00 |
| Little Neck or Swamp road—stone..... | 5.00 | 24,000 00 |
| | 12.75 | \$79,500 00 |

EIGHTH ANNUAL REPORT.

GLOUCESTER COUNTY.

| | Miles. | Est. Cost. |
|---------------------------------------|--------|-------------|
| Nortonville and Swedesboro—stone..... | 6.00 | \$30,000 00 |
| Delaware street—stone..... | 1.68 | 10,000 00 |
| | 7.68 | \$40,000 00 |

HUNTERDON COUNTY.

| | | |
|--|------|-------------|
| Middle Valley to Morris County Line—stone..... | 2.50 | \$10,000 00 |
| Rockaway Valley to New Germantown—stone..... | 1.50 | 6,000 00 |
| Lambertville to Ringoes—stone..... | 3.00 | 12,000 00 |
| | 7.00 | \$28,000 00 |

MERCER COUNTY.

| | | |
|---------------------------------------|-------|--------------|
| Ewingville School House road..... | 2.25 | \$10,000 00 |
| Pennington and Centreville—stone..... | 1.97 | 15,000 00 |
| Shabbakong road—stone..... | 1.95 | 10,000 00 |
| River road—stone..... | 4.00 | 20,000 00 |
| Olden avenue—stone..... | 2.50 | 12,000 00 |
| Dutch Neck and Princeton—stone..... | 6.59 | 35,000 00 |
| Joseph Reed's road—stone..... | 3.00 | 15,000 00 |
| | 24.69 | \$129,000 00 |

MIDDLESEX COUNTY.

| | | |
|--|-------|--------------|
| Metuchen and Stelton—stone..... | 3.00 | \$15,000 00 |
| River road, South River to South Amboy—stone.... | 7.00 | 35,000 00 |
| Highland Park and Bonhamtown—stone..... | 4.00 | 20,000 00 |
| South Plainfield and Plainfield—stone..... | 1.60 | 8,000 00 |
| New Brooklyn and Mt. Pleasant—stone..... | 1.25 | 6,000 00 |
| River road, New Brunswick to Bound Brook—stone.. | 4.00 | 20,000 00 |
| New Brunswick and Franklin Park—stone..... | 5.50 | 16,500 00 |
| New Durham and New Market—stone..... | 3.25 | 16,000 00 |
| Milltown and Spotswood—stone..... | 4.00 | 20,000 00 |
| Clifton and Ryder's Lane—stone..... | 3.00 | 15,000 00 |
| Woodbridge and Oak Tree—stone..... | 4.10 | 20,000 00 |
| | 40.70 | \$181,500 00 |

MONMOUTH COUNTY.

| | | |
|--|-------|-------------|
| Stone Church and Highland Draw—gravel..... | 2.32 | \$8,544 66 |
| Sweetman's Lane and Black's Mill—gravel..... | 2.95 | 4,500 00 |
| Keyport and Middlesex County Line—stone..... | 2.00 | 10,000 00 |
| Corless avenue—gravel..... | 4.00 | 8,000 00 |
| | 11.27 | \$31,044 66 |

COMMISSIONER OF PUBLIC ROADS.

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MORRIS COUNTY.

| | Miles. | Est. Cost. |
|---|--------|--------------|
| Stirling road—stone..... | 2.00 | \$10,000 00 |
| Williams' Corner and Townley Bridge..... | 2.05 | 10,528 00 |
| Long Hill and Gillette road—stone..... | 2.00 | 13,212 00 |
| Chester to D. L. and W. R. R.—stone..... | .96 | 4,915 00 |
| New Vernon (Sand Springs) road—stone..... | 2.00 | 10,400 00 |
| Morristown and Green Village road..... | 3.20 | 13,566 00 |
| Morristown and New Vernon—stone..... | 2.03 | 11,767 00 |
| Whippany and Swinefield Bridge road..... | 5.00 | 18,000 00 |
| Beavertown Plain and Boonton road..... | 4.28 | 11,767 00 |
| Hamburg Turnpike (Jefferson Township) road..... | .59 | 2,644 00 |
| Pompton and Pequannock River road..... | 4.30 | 17,000 00 |
| Passaic County and Mountain View road..... | 2.60 | 7,800 00 |
| Morristown and Speedwell Lake road..... | 2.00 | 6,000 00 |
| Lower Mine Hill road..... | 1.66 | 4,480 00 |
| | 34.00 | \$142,079 00 |

OCEAN COUNTY.

| | | |
|---|-------|-------------|
| Long Beach road—gravel..... | 15.00 | \$30,000 00 |
| Seaside Park road—gravel..... | 12.00 | 24,000 00 |
| Lakeside and New Egypt road—gravel..... | 18.00 | 27,000 00 |
| | 45.00 | \$81,000 00 |

PASSAIC COUNTY.

| | | |
|---|-------|-------------|
| Lackawanna avenue—stone..... | 2.00 | \$10,000 00 |
| Morton House and Bergen County Line road..... | 2.00 | 10,000 00 |
| Midvale and Greenwood Lake road—stone..... | 10.00 | 40,000 00 |
| | 14.00 | \$60,000 00 |

SOMERSET COUNTY.

| | | |
|---|-------|--------------|
| New Brunswick and Franklin Park road—½ cost.... | 5.50 | \$13,062 50 |
| Union avenue, Somerville to Raritan..... | 2.16 | \$10,260 00 |
| Passaic River to Plainfield..... | 3.00 | 14,250 00 |
| Passaic River to Liberty Corner..... | 3.00 | 14,250 00 |
| Stoutsberg to near Skillman..... | 7.00 | 33,250 00 |
| Neshanic to Somerville and Harlingen..... | 6.00 | 28,500 00 |
| Liberty School House to Conover's Corner..... | 3.50 | 16,625 00 |
| Raritan River to Potts Corner..... | 1.00 | 4,750 00 |
| Franklin Park to Middlebush..... | 4.00 | 19,000 00 |
| Baskingridge to Van Doren's Mill..... | 2.50 | 11,875 00 |
| Findern to Union avenue..... | 1.00 | 4,750 00 |
| Laban's Corner to Princeton..... | 7.00 | 33,250 00 |
| Pleasant View School House to Millstown..... | 4.75 | 22,562 50 |
| New Amwell road..... | 1.63 | 7,742 50 |
| | 52.04 | \$234,127 50 |

Total number of miles petitioned for in all the counties 423.98

Total estimated cost of all the roads petitioned for..... \$1,676,251 06

Number of tons in each road built in 1801, length, width and depth, cost of stone at quarry, and freight per ton.

| NAME OF ROAD. | Length. Miles. | Depth and width of stone. | Number of tons of stone required to build. | Cost of stone | | Freight per ton. | Cartage. |
|--|-------------------|------------------------------|--|---------------|-------|------------------|----------|
| | | | | at quarry. | cta. | | |
| Burlington County— | | | | | | | |
| Hutton road..... | 1.00 | 8 in. x 10 ft. | 2,187 | cta. | cta. | | cta. |
| High street..... | .50 | 6 in. x 16 ft. | 1,312 | 70 | 65 | 40 | 40 |
| Mount Holly and Jacksonville..... | 3.60 | 8 in. x 10 ft. | 7,875 | 60 | 60 | 20 | 40 |
| Camden County— | | | | | | | |
| Haddonfield and Magnolia..... | 2.35 | 8 in. x 12 ft. | 6,198 | 60 | 60 | 30 | 30 |
| Ashland road..... | 2.13 | 10 in. x 10 ft. | 6,291 | 75 | 75 | 30 | 30 |
| Essex County— | | | | | | | |
| Parsonage Hill road..... | 2.82 | 8 in. x 16 ft. | 9,870 | 75 | ..... | ..... | ..... |
| Eagle Rock road..... | 4.54 | 8 in. x 16 ft. | 15,900 | 75 | ..... | ..... | ..... |
| East Passaic avenue and Kingland..... | 2.00 | 8 in. x 16 ft. | 7,000 | 75 | ..... | ..... | ..... |
| Gloucester County— | | | | | | | |
| Bridgeport road..... | 6.02 | 8 in. x 10 and 16 ft. | 13,600 | 50 | 25 | ..... | ..... |
| Mercer County— | | | | | | | |
| Hutchinson's Mill road..... | 1.18 | 6 in. x 12 ft. | 2,323 | 75 | 55 | 20 | 20 |
| Edinburg to Windsor to Hightstown road..... | 7.01 | 6 in. x 14 ft. | 16,090 | 75 | 55 | 20 | 20 |
| Extension of Old York road..... | .36 | 6 in. x 14 ft. | 825 | 75 | 55 | 20 | 20 |
| Portion of Lower Ferry road (Township)..... | .52 | 6 in. x 12 ft. | 1,023 | 60 | 30 | 20 | 20 |
| Portion of Upper Ferry road (Township)..... | 1.30 | 6 in. x 12 ft. | 3,150 | 60 | 30 | 20 | 20 |
| Middlesex County— | | | | | | | |
| Carteret road..... | 1.60 | 8 in. x 12 ft. | 4,200 | 75 | 70 | 20 | 20 |
| Part of second section of Cranbury turnpike..... | 3.12 | 8 in. x 12 ft. | 8,190 | 75 | 60 | 30 | 30 |
| Cranbury and Hightstown road..... | 1.40 | 8 in. x 12 ft. | 3,675 | 75 | 60 | 30 | 30 |

COMMISSIONER OF PUBLIC ROADS.

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Number of tons in each road built in 1901, length, width and depth, cost of stone at quarry, and freight per ton.—Continued.

| NAME OF ROAD. | Length. Miles. | Depth and width of stone. | Number of tons of stone required to build. | Cost of stone at quarry. | Freight per ton. | Cartage. |
|---------------------------------|-------------------|------------------------------|--|-----------------------------|------------------|----------|
| Monmouth County— | | | | cts. | cts. | cts. |
| Bergen's Mills road..... | 1.94 | 4 in. x 12 ft. | 2,546 | 70 | 65 | 40 |
| Keyport and Kearsburg road..... | 1.51 | 8 in. x 14 ft. | 4,624 | 70 | 80 | 30 |
| Morris County— | | | | | | |
| Wippany and Parsippany..... | 3.78 | 6 in. x 12 ft. | 7,440 | 75 | 50 | ..... |
| Brooklyn and Landing..... | .526 | 6 in. x 12 ft. | 1,035 | 30 | ..... | 25 |
| Passaic County— | | | | | | |
| Echo Lake and West Milford..... | 2.66 | 4 in. x 16 ft. | 4,655 | 50 | ..... | 30 |
| North Seventh street..... | .32 | 4 in. x 16 ft. | 560 | 50 | ..... | 50 |
| West Twenty-fifth street..... | .227 | 4 in. x 22 ft. | 546 | 50 | ..... | 50 |
| Cannon Ball road..... | .78 | 4 in. x 14 ft. | 1,194 | 50 | ..... | 50 |
| Somerset County— | | | | | | |
| Pluckamin road..... | 7.93 | 8 and 10 in. x 12 and 14 ft. | 18,995 | 75 | ..... | 50 |
| Sussex County— | | | | | | |
| Lakeside boulevard..... | .75 | 6 in. x 12 ft. | 1,476 | 30 | ..... | 25 |
| Warren County— | | | | | | |
| Allamuchy..... | 5.45 | 8 in. x 12 ft. | 14,306 | 30 | ..... | 25 |
| Morris turnpike..... | 1.98 | 6 in. x 12 ft. | 3,898 | 75 | 50 | 25 |



Egg Harbor and Greenbank road, Atlantic County, before improvement.



Egg Harbor and Greenbank road, Atlantic County, $1\frac{1}{2}$ miles out of Egg Harbor, showing cut after improvement.

CH

1010



Hutton road, Burlington County, before improvement.



Hutton road, Burlington County, after improvement. Eight-inch Macadam.

DESCRIPTION OF ROADS IMPROVED IN 1901.

ATLANTIC COUNTY.

Egg Harbor and Green Bank Road, 7.03 Miles Long.

This road begins at the city line in Egg Harbor City and extends to Green Bank in Burlington county. It is built of compacted gravel, fourteen feet wide and eight inches deep. The eastern end of this road extends over a swampy ground; the western end over a heavy bed of sand until it reaches Egg Harbor, where it passes through a series of settlements which are largely engaged in the raising of grapes and fruits of different kinds. It affords an outlet for all the farming section that lies east and north of the Mullica river, and gives access to the fine markets of Egg Harbor City, which city is mostly devoted to the growing of fruits, the production of grapes and wine being a large and profitable industry. A great amount of hay, grain and stock grown in other districts are brought to it over this road.

John Hanselman, Egg Harbor, New Jersey, was the contractor.

The maximum grade was reduced from 2.70 per cent. to 1.50 per cent.

The cost per cubic yard, for gravel, was 27 cents.

The total cost was \$12,010.88.

BURLINGTON COUNTY.

Mount Holly and Jacksonville Road, 3.60 Miles Long.

This road extends from the town of Mount Holly through a fine farming section to the village of Jacksonville, the center of a rich agricultural district. It is built of macadam, ten and fourteen feet wide and six and eight inches thick. This road was very bad at all seasons of the year. It was sandy in summer and muddy in winter. It will form a fine outlet to the county seat for a large section of farming country.

J. Erwin Hillpot, Bound Brook, New Jersey, was the contractor.

The maximum grade was reduced from 3.50 per cent. to 2.50 per cent.

The cost per contract, lump sum, was \$17,743.25.

The total cost was \$19,912.20.

The Hutton Road, 1 Mile Long.

This road is a connecting link between the Mount Laurel and Evesboro stone roads. It is built of trap rock macadam, ten feet wide and eight inches thick. It passes over a sandy loam district, by several fine farms, and makes a direct passage for the roads tributary to the Mount Laurel district and the Fellowship and Merchantville roads, giving them an easy grade toward the Philadelphia market for their heavy produce.

J. R. Shanley, Newark, New Jersey, was the contractor.

The maximum grade was reduced from $2\frac{1}{2}$ per cent. to 1 per cent.

The cost per contract, lump sum, was \$5,300.

The total cost was \$5,691.25.

Stokes Road, 2.47 Miles Long.

This road begins near the grist mill at Ballenger's Mills and extends to Pipper's Corners. It is built of gravel, ten feet wide and six and eight inches thick. It extends through a very poor section of the country, but connects several thousand acres of fertile land in and around Indian Mills, bringing them in easy communication with the important towns of Burlington county. It gives access to the improved roads that lead to the Philadelphia markets. By means of this road the inhabitants of Shamong township will be enabled each year to move many thousand dollars' worth of produce to the outlying markets. It is our object to continue this line south until it meets those coming from the southeastern part of the State, thus making a continuous line from Mount Holly to the seashore, and to the fine markets of Hammonton and Egg Harbor. The soil is sandy and pine barrens, interspersed with occasional swamp clearings in which flourish profitable cranberry plantations.

W. P. White, Avon, New Jersey, was the contractor.

The maximum grade was and is practically none.

The price per contract, lump sum, was \$1,133.25.

The total cost was \$4,256.01.

Batsto and Wading River Road, 9.79 Miles Long.

This road begins at the Atsion river bridge, in Washington township, and extends to the Wading river draw-bridge. It is built of gravel, twelve feet wide and four and eight inches thick, forming a part of the continuous line intended to be built through Burlington county to the seashore. This section of it runs between two small towns in the southeastern part of the county. It makes an important road over which many teams from the Shamong farming district cart their produce to the fine market towns of Atlantic county. This, in connection with a road from Green Bank to Egg Harbor City, gives a through line for the inhabitants of that district to Atlantic City. Along this line there are a few small farms, but it passes principally through pine land and cedar swamp. The inhabitants of this section obtain their living principally from fishing in the rivers and bays for oysters, etc., but reside on the mainland in very pretty towns which they are quite anxious to connect with improved roads.

Alexander Mullen, Avon, New Jersey, was the contractor.

The maximum grade was and is practically none.

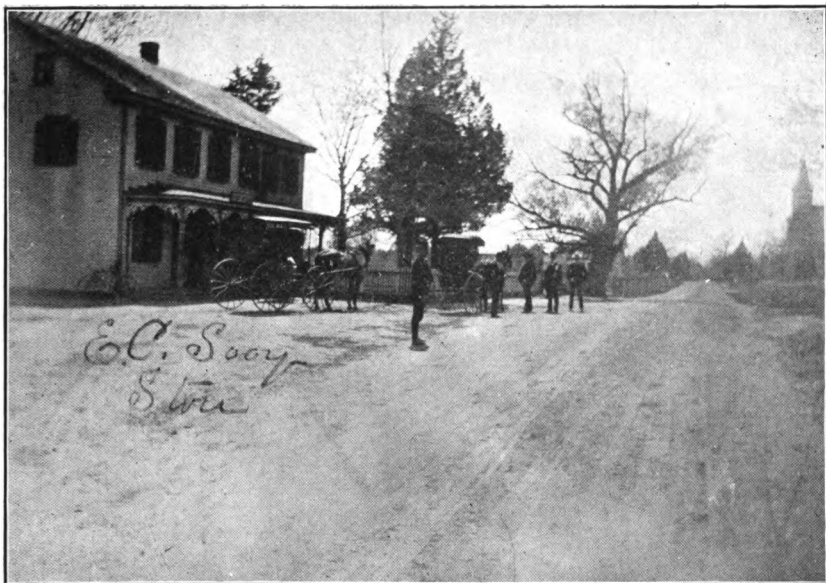
The price per contract, lump sum, was \$5,525.37.

The total cost was \$15,396.65.

High Street or Mount Holly Road, about $\frac{1}{2}$ Mile Long.

This road is a portion of High street in the city of Burlington and completes the road built from Mount Holly to and into the city of Burlington to the Delaware river, making a complete macadam pavement from the river bordering the city of Burlington to the town of Mount Holly, over six miles distant. The State contributed to a macadam road, sixteen feet wide and six inches deep, and the street railway paved the balance of the street, thus covering the whole street with a fine body of macadam.

The Trenton Stone and Construction Company, Trenton, New Jersey, was the contractor.



Wading River and Batsto, Burlington County, after improvement.



Wading River and Batsto gravel, Burlington County, through woodland and swamp, after improvement.



Seashore road, Cape May County, near Rio Grande, looking north, before improvement.



Seashore road, Gravel, Cape May County, near Rio Grande, looking north, after improvement.

The maximum grade was and is $\frac{1}{2}$ per cent.

The cost per contract, lump sum, was \$4,150.

The total cost was \$4,438.

The townships paid for the grading of all the roads in Burlington county, the cost of which is not included in the lump sum contracts.

CAMDEN COUNTY.

Ashland Road, 2.13 Miles Long.

This road begins at the White Horse stone road, in the village of Greenland, and extends via Ashland to Coffin's Corner. It is built of telford, six inches and macadam four inches thick, and is ten feet wide. It extends through a mixed farming country, some of it very poor and some very good. It gives a fine outlet for a rich farming country that lies east of Ashland, giving it easy access to the White Horse pike, an improved road leading to the Camden and Philadelphia markets, also to the railroad stations at Magnolia on the Reading road, and Ashland on the Pennsylvania road. Some of the finest farms in the State of New Jersey are located in the neighborhood of Ashland.

J. R. Shanley, Newark, New Jersey, was the contractor.

The maximum grade was reduced from 6.80 per cent to 4.05 per cent.

The price per contract, lump sum, was \$14,000.

The total cost was \$15,041.28.

Haddonfield and Magnolia Road, 2.35 Miles Long.

This road extends from Haddonfield to the White Horse pike. It is built of macadam, twelve feet wide and eight inches thick. It passes over a section of mixed soils, very poor and very rich. Near Haddonfield are fine residences and fertile farms. Snow Hill, a colored settlement along its line, rests upon sandy land. Some heavy cuts and fills had to be overcome to make an easy grade. It gives a fine outlet for the people of this section to Haddonfield, also to the great artery north and south the White Horse pike.

J. R. Shanley, Newark, New Jersey, was the contractor.

The maximum grade was reduced from 5.14 per cent. to 4.16 per cent.

The price per contract, lump sum, was \$14,000.

The total cost was \$15,771.92.

CAPE MAY COUNTY.

Seashore Road, 12.17 Miles Long; 6 Miles of which were Built this Year.

This road virtually extends from the city of Cape May to the Cape May Court House. It is built of Henry D. Moore's gravel, near Tuckahoe, and is fourteen feet wide and six and eight inches thick. One-half of the road was completed this year. It is built through a level, flat farming country, over a sand and sandy loam soil. It affords a fine drive for the numerous summer pleasure seekers at Cape May, and also a hard road to convey the produce of the many truck farmers living along its line to the markets of Cape May City.

B. F. Sweeten and Son, Camden, New Jersey, were the contractors.

The maximum grade was and is practically none.

The cost per contract, lump sum, for labor, was \$7,326.

The total cost was \$21,336.18.

ESSEX COUNTY.

East Passaic Avenue and Kingsland Road, 2 Miles Long.

This road begins at the corner of East Passaic avenue and centre street, in the town of Franklin, and extends to the Passaic county line. It is built of telford, five inches thick, and macadam three inches thick, and is sixteen feet wide. It extends over a glacial drift soil. This road connects the improved systems of Essex county with those of Passaic.

The Osborne and Marsellis Company, Montclair, New Jersey, was the contractor.

The maximum grade was reduced from 7.2 per cent. to 6.6 per cent.

The price per square yard for eight-inch telford was 52 cents.

The cost was \$17,125.77.

Parsonage Hill Road, 2.82 Miles Long.

This road begins at the westerly side of the Old Short Hills road in Milburn, and runs westerly over the lower part of the Second Mountain to the Budd's Lane road (previously macadamized) in West Irvington or Washington Place, passing over a series of ridges composed of glacial drift full of boulders of all sizes. It is built of telford macadam, sixteen feet wide and eight inches thick. The heavy cuts on this road have been in themselves of great benefit to the traveling public, and if nothing else had been done on this road except the grading it would have been a vast improvement.

As this road connects with Springfield avenue, which runs south of the Orange mountain, it will be of great benefit to the milkmen and farmers as it will enable them to avoid the steep grades over the Orange mountain. Thus it will form the main outlet for the farmers of the region beyond the western end of the road as far as Whippany.

Charles A. Lighthipe and Herbert Lighthipe, Orange, New Jersey, were the contractors.

The maximum grade was reduced from 9.85 per cent. to 7.30 per cent.

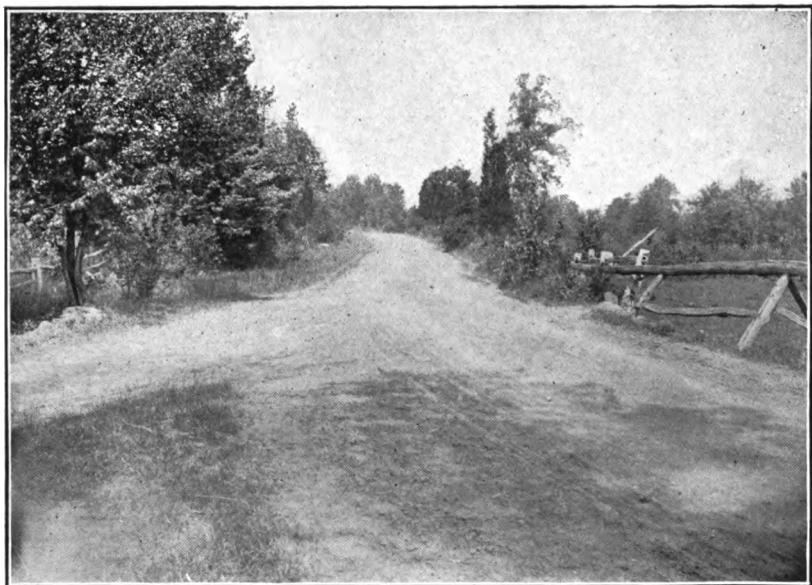
The cost per square yard for eight-inch telford was 75 cents.

The cost was \$26,469.30.

Eagle Rock Road, 4.54 Miles Long.

This road begins at Pleasantdale, at the westerly side of Pleasant Valley road, and runs westerly over a trap-rock ridge, passing between a brown sandstone quarry, on the north, and a trap-rock crushing plant, on the south, to Rosedale, where it crosses Roseland avenue and continues thence in the same general course through the farming lands of the Passaic valley to the Passaic river at Swinefield Bridge. It is built of telford macadam, sixteen feet wide and eight inches thick.

This road makes a good outlet at all seasons for the farmers and many milkmen who travel it every day on their way to supply their customers in the Oranges and Newark. The improvement is of great value to the residents of the section through which it passes, as, owing to the varied character of the soil, it being composed of glacial drift and at the western end of the more clayey deposits of the bed of the now extinct lake Passaic, it was in many places almost impassable in the spring. The saving in time, extra horses and repairs will amount to many dollars to the milkmen who must travel along it every day.



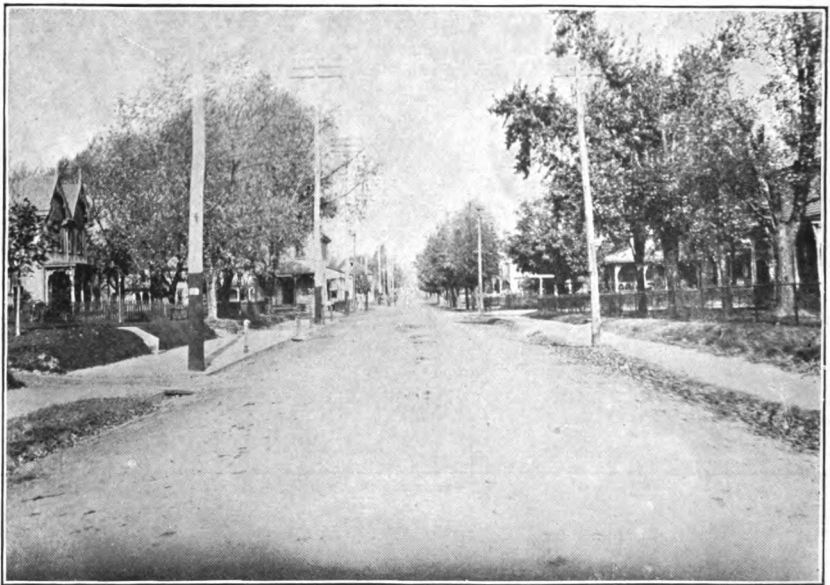
Eagle Rock Avenue, Essex County, before improvement.



Eagle Rock Avenue, Essex County, after improvement. Eight-inch Telford.



Clayton and Glassboro road, opposite gravel-bed, looking south, Gloucester County, during construction, showing sub-grade.



Clayton and Glassboro road, south of High Street, looking north, Gloucester County, after one year's wear.

Robert Wright and Stuart Lindsley, Orange, New Jersey, were the contractors. The maximum grade was reduced from 10.53 per cent. to 7.75 per cent. The cost per square yard for eight-inch telford was 57 cents. The cost was \$32,105.51.

GLOUCESTER COUNTY.

Mullica Hill Road, 6.54 Miles Long.

This road is a part of the Mullica Hill and Woodbury turnpike, and extends from the northerly end of bridge, over Oldman's creek, to the southerly terminus of the Mullica Hill and Woodbury turnpike. It is built of gravel, fourteen feet wide six, eight and ten inches thick. It runs through a very finely cultivated farming district, devoted to the raising of milk and vegetables, grain, grass and fruit for the Philadelphia markets.

B. F. Sweeten & Son, Camden, New Jersey, were the contractors.

The maximum grade was and is 5 per cent.

The price per cubic yard for compacted gravel was 26½ cents.

The total cost was \$10,624.51.

Bridgeport Road, 6.02 Miles Long.

This road begins at the Nortonville bridge in the township of Logan, and extends to the Paulsboro and Swedesboro stone road. It is built of macadam, ten and sixteen feet wide and eight inches thick. It extends through a truck farming district, sandy and sandy loam land in which sand predominates.

This road passes through the pretty village of Bridgeport situated on the Raccoon creek. It is very near the Delaware river, and the different streams such as Raccoon creek and Oldman's creek are navigable quite a distance into the country. A large amount of material is carted by boats to the Wilmington and Philadelphia market. This road gives fine access to the different shipping points and also to the Philadelphia markets.

The Delaware Granite and Mining Company, Wilmington, Delaware, was the contractor.

The maximum grade was reduced from 2½ per cent. to 2 per cent.

The price per contract, lump sum, was \$22,181.10.

The total cost was \$23,662.85.

Clayton and Glassboro Road, 4.88 Miles Long.

This road begins at the southerly terminus of the Westville and Glassboro road, and extends to the northerly end of the Franklinville gravel road. It is built of gravel, fourteen feet wide and from curb-line to curb-line in Glassboro and Clayton, and is six and eight inches thick.

This road makes an improved boulevard between the cities of Glassboro and Clayton, two of the most thriving glass centers in the southern part of the State. The soil over which it passes is a sandy loam, and quite a number of pretty homes are located along the line of the road. It completes the link between Camden and Malaga, a continuation of which is projected through Vineland and Millville.

Joseph S. Fisler, Clayton, New Jersey, was the contractor.

The maximum grade was reduced from 1.65 per cent. to .7 per cent.

The price per cubic yard for compacted gravel was 29 cents.

The total cost was \$15,160.42.

MERCER COUNTY.

Portion of Upper Ferry Road, 1.30 Miles Long.

This road begins at Ewingville, in the township of Ewing, and extends to the Scotch road near Ewing station. It is built of macadam, twelve feet wide and six inches thick. It forms a connecting link between the Asylum road and the Pennington and Trenton roads, making a continuous drive from Trenton over one line, returning over another line. It also connects the different sections with the through lines that have been built northwest from Trenton. This road is a township road.

John Risdon, Trenton, New Jersey, was the contractor.

The maximum grade was reduced from 5.2 per cent. to 3.66 per cent.

The cost per contract, lump sum, was \$5,312.00.

The total cost was \$6,323.80.

Portion of Lower Ferry Road, 2,733 feet or .52 Miles Long.

This road begins at Pennington macadam, in township of Ewing, and extends to Asylum road. It is built of macadam, twelve feet wide and six inches thick. It extends through a fine farming section and connects some township roads with the State macadam roads. This road is a township road.

John Risdon, Trenton, New Jersey, was the contractor.

The maximum grade was reduced from 1.7 per cent. to 5 per cent.

The cost per contract, lump sum, was \$2,384.

The total cost was \$2,587.60.

Extension of Old York Road, 1,915 feet or .36 Miles Long.

This road completes the Old York road through the borough of Hightstown to its connection with the Edinburgh and Hightstown road. This, with the Old York road, makes a very finely macadamized street through the whole length of the main street of Hightstown. It is built of macadam, fourteen feet wide and six inches thick.

John Sinkhorn and Company, Trenton, New Jersey, was the contractor.

The maximum grade was reduced from 3.55 per cent. to 2.60 per cent.

The cost per contract, lump sum, was \$2,395.

The total cost was \$3,388.37.

Hutchinson's Mill Road, 1.18 Miles Long.

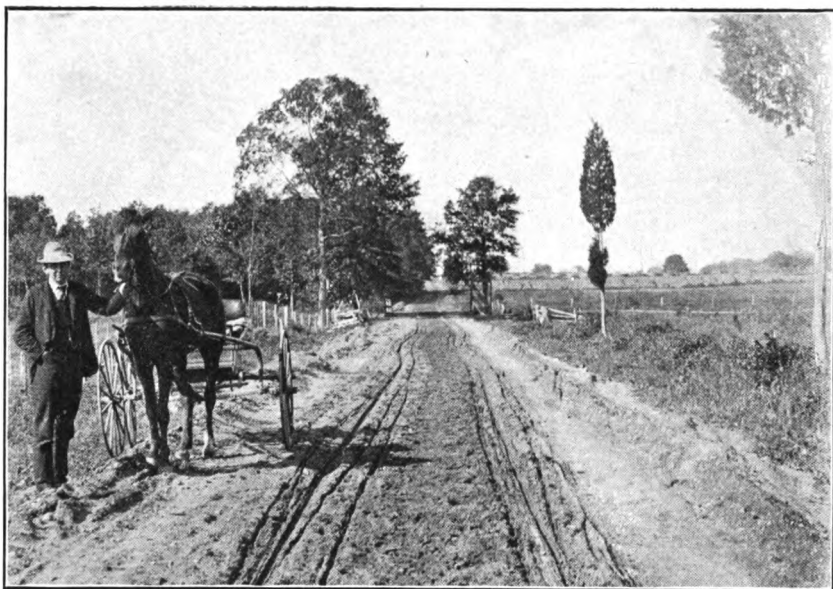
This road begins at Trenton and Allentown turnpike and extends to the Pennsylvania railroad. It is built of macadam, twelve feet wide and six inches thick. It gives an outlet for the flour and manufacturing mills along its line; also a fine outlet to the city of Trenton.

John Sinkhorn and Company, Trenton, New Jersey, was the contractor.

The maximum grade was reduced from 6.6 per cent. to 3.08 per cent.

The cost per contract, lump sum, was \$5,584.

The total cost was \$6,977.



Hightstown and Manalapan road, Middlesex County, before improvement.



Hightstown and Manalapan road, Middlesex County, after improvement.
Six-inch Macadam.

Edinburgh, Windsor and Hightstown Road, 7.01 Miles Long.

This road begins at Edinburgh and extends to the division line between Mercer and Middlesex counties. It is built of macadam, fourteen feet wide and six inches thick. It passes through several villages and forms a portion of the great continuous line between Jersey City, New Brunswick and Trenton. The country along its whole line is well cultivated, but the formations are so peculiar that an immense amount of underdraining had to be done along its bed.

John Sinkhorn and Company, Trenton, New Jersey, was the contractor.

The maximum grade was reduced from 7.2 per cent. to 2.58 per cent.

The cost per contract, lump sum, was \$44,824.

The total cost was \$56,286.83.

MIDDLESEX COUNTY.

Cranbury and Hightstown Road, 1.40 Miles Long.

This road begins at the Cranbury Station road and extends to the Mercer county line. It is built of macadam, twelve feet wide and eight inches thick. It passes over a sandy loam soil, and through a very fine farming district. This road is the last link in Middlesex county connecting the roads north with the system south, making a continuous road from Newark to Trenton. It would have been built last year had it not been that the road fund in Middlesex county was exhausted. Bicycles, automobiles and pleasure carriages can now travel from Newark to Trenton without being forced at any time to wade through mud and sand.

The Trenton Stone and Construction Company, Trenton, New Jersey, was the contractor.

The maximum grade was reduced from 4 per cent. to 2 per cent.

The cost per contract, lump sum, was \$9,472.32.

The total cost was \$11,939.36.

Hightstown and Manalapan Road, 2.53 Miles Long; 1 Mile Paid for this Year.

This road begins at the Mercer county line, in the township of Monroe, and extends to the Monmouth county line. It is built of macadam, twelve feet wide and eight inches thick. This road passes through a good farming district, and is a part of the continuous line from Hightstown to Freehold, all of which is now built from Hightstown to Manalapan, from which point a gravel turnpike, formerly a toll road, extends to Freehold. It was necessary to construct this road in order to fill up the gap between Trenton and the seashore.

The Trenton Stone and Construction Company, Trenton, New Jersey, was the contractor.

The maximum grade was reduced from 4 to 2 per cent.

The cost per contract, lump sum for the entire road, was \$17,132.16.

The total cost of one mile, \$6,729.51.

Carteret Road, 1.60 Miles Long; One Mile of which was Completed last Year and the Balance, .60 of a Mile, this Year.

This road begins at the Central Railroad of New Jersey station and extends to the Union county line. It is built of macadam, twelve feet wide and eight inches thick. This road gives an outlet for the people of Carteret to the city of Rahway, through a fair farming district.

Robert A. Montgomery, Lambertville, New Jersey, was the contractor.

The maximum grade was reduced from 4 per cent. to 2 per cent.

The cost per square yard for eight-inch macadam was 69 cents.

The total cost was \$7,730.56.

MONMOUTH COUNTY.

Bergen's Mills Road, 1.94 Miles Long.

This road begins at Manalapan church, in the township of Millstone, and extends to the Middlesex county line. This is the last link in the line of improved roads between Trenton and Freehold and the upper shore. It runs through a fairly good farming country, over sandy alluvial soil. It is built of trap-rock and iron-stone. Five inches of iron-stone from the adjoining meadows were placed in the bottom and thoroughly compressed with the roller, then upon this surface was placed five inches of Rocky Hill trap-rock. It makes a very fine surface and promises to be as enduring as if made entirely of trap.

Tunis V. Conover, Manalapan, New Jersey, was the contractor.

The maximum grade was reduced from 2.50 per cent. to 1.40 per cent.

The cost per contract, lump sum, was \$10,997.50.

The total cost was \$11,552.42.

Keyport and Keansburg Road, 1.51 Miles Long.

This road begins at the easterly boundary line of Keyport, in the township of Raritan, and extends a distance of one mile or more east. It is built of macadam, fourteen feet wide and eight inches thick. It runs through a sandy and sandy loam district in which the land is principally used for trucking for the New York markets. It is intended to extend the road the coming season to Keansburg, opening out a large section of the country which will have to use the road to convey the produce to Keyport, to be shipped from there to New York City.

J. R. Shanley, Newark, New Jersey, was the contractor.

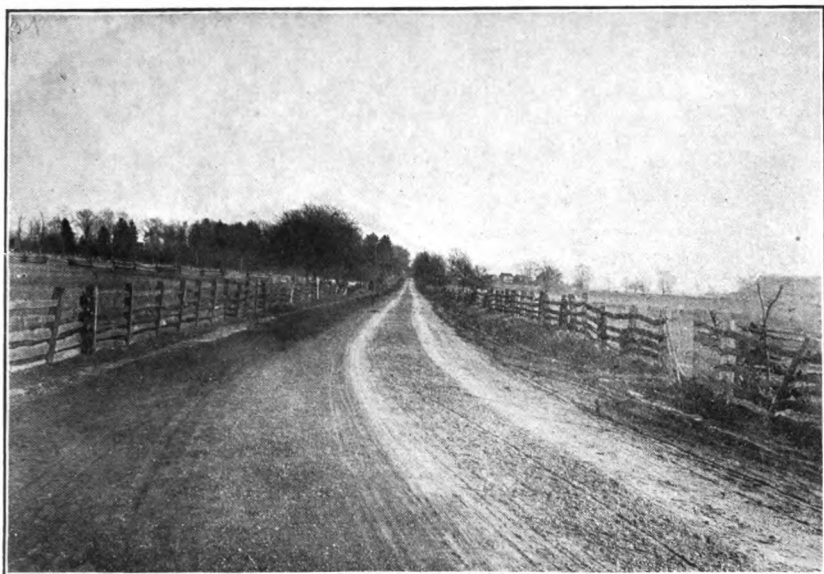
The maximum grade was reduced from 4.47 per cent. to 2.8 per cent.

The cost per contract, lump sum, was \$10,453.33.

The total cost was \$11,307.05.

Lower Squankum and Turkey Road, 7.73 Miles Long; the First Section, or 4.51 Miles of which were built in 1899, and the Second Section, or Yellow Brook and Turkey Road, 3.22 Miles Built in 1900.

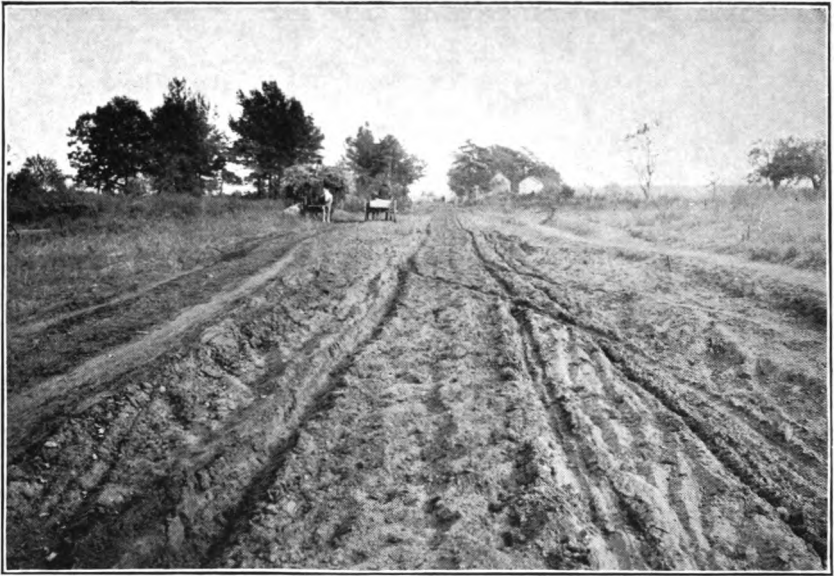
The first section of this road extends from Lower Squankum through Farmingdale to Yellow Brook, and the second section extends from Yellow Brook to Turkey. It is built of gravel, fourteen feet wide and nine inches thick. This road extends through an almost level country. The soil is sandy



Bergen's Mill ore and stone road, Monmouth County. Four inches iron ore in bottom, faced with four inches of trap.



Bergen's Mill ore and stone road, Monmouth County. Four inches iron ore and four inches of trap rock.



Key Port and Keansburgh road, Monmouth County, before improvement.



Key Port and Keansburgh road, Monmouth County, after improvement. Eight inch Macadam.

loam, most of it very good farming land. Large quantities of fruit and vegetables are raised for the seashore market. It forms part of the improved line from the county seat, Freehold, to Manasquan, and the lower seaside resorts in Monmouth county.

James H. Butcher, Ardena, New Jersey, was the contractor for the first section. L. E. Watson, Asbury Park, New Jersey, was the contractor for the second section.

Price per cubic yard, for compacted gravel for first section, 55 cents; for second section, 48 cents.

The maximum grade was reduced from 1.75 per cent. to 1 per cent.

The total cost was \$5,302.94.

MORRIS COUNTY.

Whippany and Parsippany Road, 3.78 Miles Long.

This road begins at Whippany and extends to Parsippany. It is a continuation of the Morristown and Whippany road, and also connects with the Denville and Pine Brook road at Parsippany. It is built of macadam, twelve feet wide and six inches thick. It passes through an agricultural country, over a sandy loam section, along which are located several small farms. This road gives an outlet over an improved macadam road by the way of Whippany to Morristown, and by the way of Parsippany over the Pine Brook and Denville road to Orange and Newark, completing a net-work of roads that point in every direction towards Morristown.

Dickerson and Gill, Rockaway, New Jersey, were the contractors.

The maximum grade was reduced from 8 per cent. to 6 per cent.

The price per square yard for macadam was 52 cents.

The total cost was \$21,978.18.

Brooklyn and Landing Road, .526 of a Mile Long.

This road begins at the macadam road at Landing and extends to the Sussex county line. It is built of macadam, twelve feet wide and six inches thick. It runs parallel with Lake Hopatcong, and it connects the Morris county pike with the Lakeside boulevard, making a continuous line from the Delaware, Lackawanna and Western depot, at Landing, to the cottages along Lake Hopatcong. We hope this road will be the beginning of a continuous line leading into the heart of Sussex county.

Milton J. Black, Rockaway, New Jersey, was the contractor.

The maximum grade was reduced from 10 per cent. to 4 per cent.

The cost per square yard for six-inch macadam was 36 cents.

The total cost was \$2,745.56.

PASSAIC COUNTY.

Cannon Ball Road, .78 Miles Long.

This road begins at the station on the New York, Susquehanna and Western railroad and extends to the Metallic Cap Works in the borough of Pompton Lakes. It is built of macadam, fourteen feet wide and four inches thick.

This road is one built by and for the Metallic Cap Works and leads from their works to the railway station. It is of revolutionary origin, having been

built by Mr. Ryerson, the proprietor of the old Pompton Bloomery Forge, for the purpose of conveying the cannon balls, manufactured by him for the British, through the lines of the American forces. Thus, this road furnishes us with another example of history repeating herself, as it was built for the purpose of conveying the munitions of war over one hundred years ago, and is now being improved for the same purpose.

Colfax and Steele, Preakness, New Jersey, were the contractors.

The maximum grade was reduced from 4 per cent. to 1 per cent.

The cost per square yard for four-inch macadam was 25 cents.

The total cost was \$2,776.91.

Echo Lake and West Milford Road, 2.66 Miles Long.

This road is a continuation of the Echo Lake road, beginning at its terminus, the Echo Lake post-office, and extending northerly for a distance of 2.66 miles to the road leading to Newfoundland at Henry Crawford's. It is built of macadam, sixteen feet wide and four inches thick. It extends over a glacial drift soil, composed of sand, clay and boulders. The valley through which it runs is quite rough and hilly, though very fertile, and it is dotted with many fine farms, rich pasture lands and thriving orchards.

This road is the main north and south highway from the famous Paterson and Hamburg turnpike to Greenwood lake, and when completed to that body of water, will form one of the finest and most picturesque drives in the State of New Jersey

The Preakness Crushing Company, Paterson, New Jersey, was the contractor.

The maximum grade was reduced from 12 per cent. to 6 per cent.

The price per square yard for macadam, 24 cents.

The total cost was \$14,634.65.

North Seventh Street, .32 Miles Long.

This street begins at Temple street and extends to Haledon avenue. It is built of macadam, sixteen feet wide and four inches thick. It is a very short section. One-half of the street is lined with residences; the remainder is unimproved. It is a very great improvement for a section of Paterson that is being developed.

Peter Bailey, Mountain View, New Jersey, was the contractor.

The price per square yard for macadam was 21 cents.

The total cost was \$1,111.32.

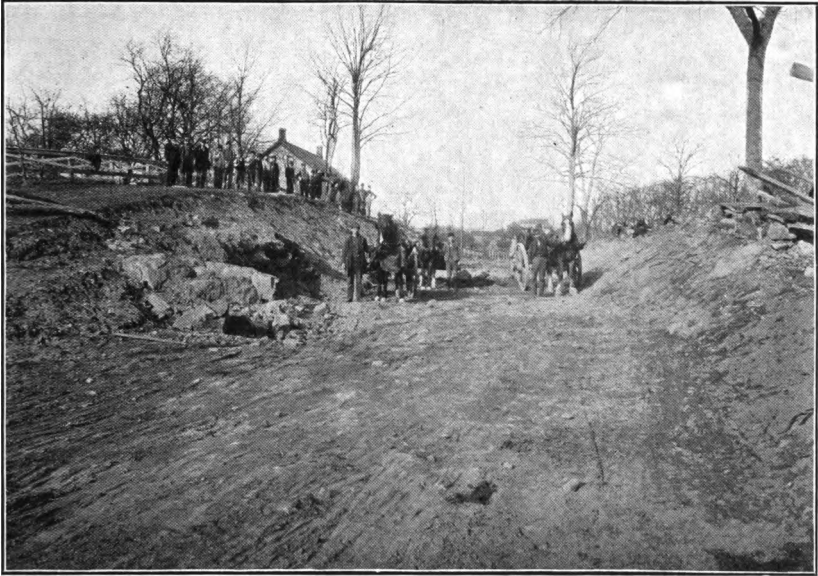
West Twenty-fifth Street, .227 Miles Long.

This street begins at West Eighteenth street and extends to Stony road. It is built of macadam, twenty-two feet wide and four inches thick. It is a short street in the suburbs of Paterson, and gives the inhabitants access over the improved roads, to the macadamized roads that extend in different directions alongside of it.

Peter Bailey, Mountain View, New Jersey, was the contractor.

The price per square yard for macadam was 19½ cents.

The total cost was \$622.05.



Echo Lake and West Milford road, Passaic County, northerly portion, during improvement.



Echo Lake and West Milford road, Passaic County, northerly portion, after improvement.
Four inch Macadam.

н.



Pluckamin road, near Somerville, Somerset County, N. J., before improvement.



Pluckamin road, near Somerville, Somerset County, N. J., after improvement.
Ten-inch rock bottom.

SOMERSET COUNTY.

Pluckamin Road, 7.93 Miles Long.

This road begins at Peters' Brook bridge on Mountain avenue, in the town of Somerville, township of Bridgewater, and extends in a northerly direction to Bedminster and easterly to bridge over Raritan river. A portion of it is built of rock-bottom, twelve and fourteen feet wide, ten inches thick, and a portion of macadam, twelve and fourteen feet wide and eight inches thick. It extends through pretty valleys, picturesque mountains running in parallel lines on each side. It is a continuation of the road built from Morristown to the Somerset county line and also of the Mine Brook road. Its completion forms a macadam road from Morristown to Somerville, through a well developed and thickly settled farming district, in which are several small towns.

This road affords an outlet for the many farmers in either direction to the excellent markets at each end, and also a beautiful drive for the residents of the large cities who are buying up and improving the picturesque sites overlooking the valley in which it runs. It completes the circle by which persons from Morristown can drive through Bernardsville, Bedminster, Short Hills and Pluckamin to Somerville, thence through Bound Brook, Plainfield, Westfield, Springfield, Chatham and Madison back to Morristown, making a fifty miles' pleasure drive through one of the most delightful residence sections of New Jersey.

William Hardgrove, Somerville, New Jersey, was the contractor.

The maximum grade was reduced from 8 per cent. to 5 per cent.

The price per contract, lump sum, was \$28,854.50.

The total cost was \$31,488.14.

SUSSEX COUNTY.

Lakeside Boulevard, Section No. One, .893 Miles Long.

This road begins at the Morris county line, at Brooklyn, and extends to Hopatcong House, Lake Hopatcong. It is built of macadam, twelve feet wide and six inches thick. It is part of the road that connects the town of Landing with the borough of Brooklyn. It gives an easy drive for the inhabitants of the borough of Brooklyn and the residents who summer along the north side of Lake Hopatcong to the railroad stations of the Delaware, Lackawanna and Western railroad. It runs through the woods over a boulder soil. Thousands of boulders line the sides of the road.

This road was built to accommodate the summer residents of this section of the country. It may in time be extended up through Sussex county, connecting the improved sections of Sussex with Lake Hopatcong.

Salmon Brothers, Ledgewood, New Jersey, were the contractors.

The maximum grade was reduced from 10 per cent. to 6.86 per cent.

The price per square yard for macadam was 44 cents.

The total cost was \$5,815.58.

WARREN COUNTY.

Allamuchy Road, 5.45 Miles Long.

This road begins at the Hackettstown town line and extends to the Warren and Sussex county line. It is built of macadam, twelve feet wide and eight inches thick. It extends through a wild and picturesque country in which there is considerable heavy grading. It passes over a drift soil. It will form a very fine outlet for the farming section of the Tranquility Valley to the thriving town of Hackettstown. This road is the first one built in Warren county, and since its inception several other roads have been applied for.

Jerre B. Salmon and Herbert K. Salmon Ledgewood, New Jersey, were the contractors.

The maximum grade was reduced from 13.34 per cent. to 9.7 per cent.

The price per square yard for macadam was 44 cents.

The total cost was \$23,942.80.

Morris Turnpike, 1.98 Miles Long.

Section one begins at the bridge over the Delaware, Lackawanna and Western railroad and extends southwesterly to Washington borough line.

Section two begins at Franklin township line and extends to Washington borough line.

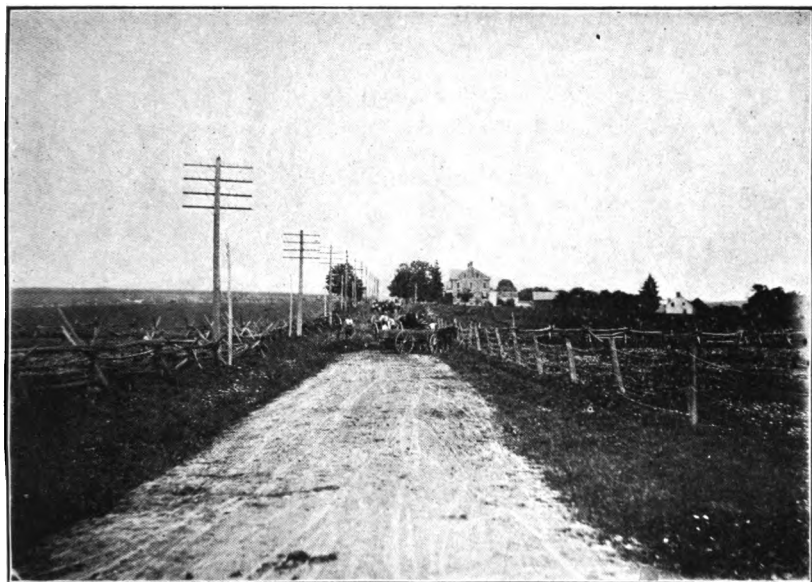
This road is built of macadam, twelve feet wide and six inches thick. This is the commencement of a line of roads which will eventually extend from Washington to Belvidere, through a very picturesque and fine farming country.

James C. Stanley, Little Falls, New Jersey, was the contractor.

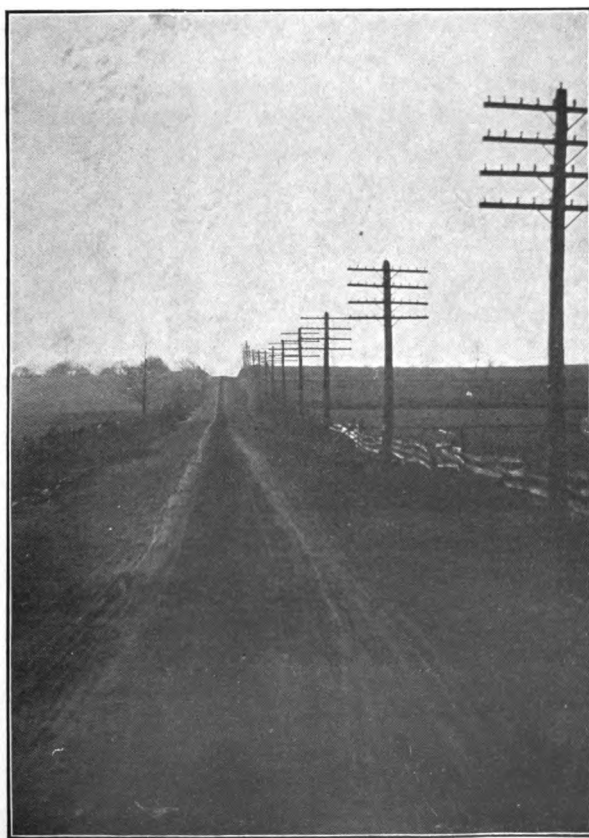
The maximum grade was reduced from 8.66 per cent. to 5 per cent.

The price per square yard for macadam was 59 cents.

The total cost was \$12,262.69.



Grading Morris turnpike on east side of Pohatcong Creek, Washington, Warren County.



Showing Morris turnpike finished west of Pohatcong Creek, Washington, Warren County.

Road Improvement in New Jersey for the Year 1901.

As a beautiful stream flows steadily onward, gathering volume in its course, until it carries the commerce of a nation, so the work of road building in New Jersey proceeds ever forward towards its goal—the improvement of the leading highways of the State—until the commodities of a commonwealth move with little friction into the finest markets of the world.

The State aid for this year has become responsible for the building of 109 miles of roads at a cost of \$450,000, one-third of which will consume the State appropriation for the year, namely, \$150,000. The counties of Atlantic, Camden, Cape May, Burlington, Essex, Gloucester, Mercer, Middlesex, Monmouth, Morris, Passaic, Somerset and Warren are this year recipients of the State's bounty. Cumberland, Hudson, Ocean and Salem were applicants, but did not commence their preliminary work soon enough to receive a portion of this year's appropriation.

The demand for good roads is constantly increasing. Many more miles could be added to our annual list were the appropriation large enough. The ability to construct with rapidity has been much lessened this year by climatic influences. Our contractors lost nearly two months by insects, the excessive rains, an intensely hot period, and the diseases of horses common to the unusually wet weather that prevailed during the first and best part of the building season. Although the fall has been unusually fine, the returns from finished work were late for our general summary of cost, and the different causes mentioned prevented several roads from being finished in time to receive the benefit of this year's appropriation.

The great number of roads applied for in the different counties of the State, and the intense desire of many to have them immediately improved, so that the present generation can reap the advantages thereof, makes it quite embarrassing, with the limited means at our

disposal, to be unable to supply the necessary funds. This leads us to the point that only by increased State appropriation can we, in a measure, satisfy the great demands of our people. An additional appropriation of \$150,000 would be none too much to make the working of the State Aid law easy, and to facilitate the improvement as rapidly as the larger portion of our citizens desire. Not only this, but the law should be amended so that counties, if they so desire, could expend one-half of one per cent. for road improvements, instead of one-fourth as the law now allows.

The necessities of some counties are so great, especially agricultural ones, that the inhabitants of those counties are fighting like hungry wolves each to have their roads first improved. In no way can the State add to its wealth more rapidly than by giving of its surplus to the hardening of its roadbeds. By this process so many millions of dollars would be added to the wealth of the State that, if the present sources of State revenue should by any means cease and the State thereby be forced to impose a direct tax, property values would be so increased that the taxes would rest but lightly upon its inhabitants. During the past year the taxable value of the State has increased more than twenty-seven millions of dollars, and although this is not all attributable to good roads, yet a large part of it is, for most of the added wealth and population settles in greatest volume along the improved roads. Much of the immense wealth in the cities near us is rapidly moving into our State, and permanently remaining wherever the roads present similar conditions to the streets of the cities.

In our travels around the State we often hear expressions made by men of liberal means, dwelling during the summer in many portions of our State, that if their neighborhoods would have roads such as they could pleasantly travel over all winter, they would spend the fall and most of the winter months at their country homes. Their constant affirmation is that if they could travel to lectures, schools, churches and trading centers through the winter, over hard, smooth highways, the city would have but little attraction for them.

They would no longer be cooped up in narrow streets and closely crowded houses, where comfort only is attained, but would reside where wide spreading landscapes and plenty of fresh air give opportunity for health and strength not afforded in populous cities.

There are several localities in our State where the improvement of the common roads has been instrumental in increasing and attracting to each from one to three or four millions of wealth during the

few years we have been engaged in this work. In no State in the Union can road improvement add so largely to the population as in New Jersey, for the largest part of our territory is situated within short distances of the greatest cities in the Union. Our State, in all parts, has frequent and rapid communication with them by steam roads, while trolley lines are being projected and built in all directions. Now if our common roads are rapidly improved, our population will be increased beyond the calculation of the most optimistic, and much wealth will be added to our State.

Following is a short resume of progress in each county of the State during the past year, commencing with the most northern counties and proceeding southward until terra-firma gives way to ocean:

Sussex county has not fully entered the race, only improving one short township road, near Lake Hopatcong, called the Lakeside boulevard. This road begins at the Morris county line, at Brooklyn, and extends to Hopatcong House, Lake Hopatcong. It is three-quarters of a mile in length.

Warren county this year made its first move in creating hard roads, having macadamized the Allamuchy road, 5.45 miles long, extending from Hackettstown to the boundary line between Warren and Sussex counties, thus opening up a picturesque country. She also built the Morris turnpike, 1.98 miles long. The borough of Washington is improving Washington avenue, Belvidere avenue and Broad street, altogether 1.43 miles long, all of which are to be extended in different directions, giving a fine outlet for the fertile and scenic valleys surrounding this enterprising town.

Morris county comes next, and is one of the ambitious counties, asking for fifty miles and this year attempting to improve thirteen miles, but failing to complete more than five, on account of the extremely wet weather which delayed the contractor during two months of what is ordinarily the best building season.

Somerset county can now boast of about thirty-five miles of State aid roads. She pursues a conservative policy, improving not more than seven or eight miles each year, but all these roads are important links in the great chain that is connecting her centers of trade with the large outlying cities and towns of the neighboring counties.

Hunterdon county this year appropriated \$20,000, and was guaranteed \$10,000 from the State, for the construction of stone roads.

The improvement, however, was deferred and the county remains without any roads constructed under State aid.

Essex county, having been stoning her highways for twenty-five years, has to her credit nearly three hundred miles of hard roads; yet is each year, through State aid, a liberal claimant for many more miles. At present rate of progress she will, before many years, have all her roads macadamized. Having last year exceeded the State appropriation, this year was consumed in finishing and paying for 9.36 miles of roads. This month, November, finds her starting to build six miles, to be paid for out of the appropriation for 1902.

Passaic county, with about two hundred miles of leading thoroughfare improved under township, county and State acts, does not halt, and is this year claiming her share of State aid for the improvement of seven miles.

Hudson county last year built a handsome boulevard with State aid; this year had another in contemplation, but did not prepare the preliminary surveys in time for this year's bounty. She will be a candidate for next year's appropriation.

Bergen county, with about one hundred and seventy miles of township roads improved by the Township Bonding act, has not as yet decided to embrace the State aid, but has many unimproved roads which the northern section of the county is seeking to bring under the influence of the State aid.

Union county was a liberal claimant for State aid last year. This year did not present any claims. A number of years ago she improved forty miles, covering, under the County act, nearly all her important roads with hard pavements.

Middlesex, the first county to embrace State aid, and every year since a liberal claimant for the same, still has fifty miles petitioned for. Having overbuilt last year, she has this year only constructed one short road, but received State aid for six and one-half miles commenced last year and finished this. She presents a large mileage for construction in 1902.

Monmouth county this year can only be credited with one gravel road, not yet finished, 4.71 miles long, leading north out of Lakewood. She reserved her energy for buying up her toll pikes. She expended \$40,000 this year in placing upon the free list twenty miles of what have been for over thirty years toll roads, thus making all her improved roads free. She is a large claimant for State aid in 1902.

Mercer county last year performed the most wonderful feat in road building in the history of road improvement in the State, macadamizing eighteen miles in less than six months. Such a display of energy needed a year for recuperation, hence only two and one-quarter miles is her record for this year, but in 1902 she is a candidate for all she can obtain from the State.

Burlington is the largest and possesses more fertile agricultural land than any county in the State, and has more mileage of common roads than either of her sister counties. The composition of her farming lands is principally clay and sandy loam. Her roads under the wear of travel and the elements for over one hundred years have lost their clay, leaving the beds so sandy they are at times almost impassable for the heavy teaming necessary to cart her multifarious products to market, hence the necessity for and the desire upon the part of her farmers for more hard roads than other counties of the State. So she moves steadily along from year to year, using all of her own assessment, one-fourth of one per cent., the limit of the law, and all she can get from the State to meet it, in addition requiring her townships to grade at their own expense all of the roads receiving State aid. Burlington county reasons rightly when she says that the roads, after they are improved by State aid, become county roads, and thus cease to be township charges; therefore, the townships can better afford to grade, at their own expense, expending for the same a sum not greater than the cost of annual repairs, thus enabling the county to distribute the State and county funds over a large mileage. This year she receives State aid for about eighteen miles of stone and gravel roads—mostly gravel—which added to her present mileage gives her one hundred and twenty-three miles of hard roads. Unless she is allowed by law to raise one-half of one per cent. upon her ratables she will make slow progress in macadamizing the one hundred and twenty-five miles applied for.

Camden county comes next in our list with three important roads, 8.86 miles, built this year. She is a large claimant for State bounty next year. The rapidly growing manufacturing city of Camden demands that all her approaches shall be the hardest kind of road metal.

Gloucester, for a county that had to be mandamus'd to build her first hard road, is coming wonderfully to the front, inasmuch as she demands that all her roads shall be improved, and this year pays for seventeen and one-half miles of stone and gravel roads. No

wonder she desires hard roads, for her light, sandy soil, on account of this easier transportation, is bringing her skillful farmers and truckers more certain and substantial wealth than the Klondike mines.

Salem county started to build seven miles of shell roads this year, but the great floods of the summer so damaged her bridges and tide-water banks that many thousands of dollars intended for hardening her roads had to be diverted toward the restoration of these necessary structures.

Cumberland, one of the last in the race of counties for State aid, comes forward this year as a candidate for ten miles of improved roads through the whole length of Landis township, to and by the thriving cities of Vineland and Millville, making another link in the through line between Camden and Cape May.

Atlantic county, with thirty miles of gravel and three miles of stone roads built by State aid, with the thriving and rapidly growing cities of Hammonton, Egg Harbor and Atlantic City within her borders, does not hesitate to build each year, with incomparable gravel, long stretches of beautiful roads through her pine districts, connecting all the important towns within and without her borders, causing many settlements to follow in their wake.

Cape May, the last county before New Jersey merges her borders into the bay and ocean, this year inaugurated a system of road improvement by starting a beautiful boulevard of gravel, twelve miles long, from the famous seaside resort of Cape May to Cape May Court House, and 1.80 miles of an avenue through the southern section of rapidly growing Ocean City.

Surely the people of New Jersey are thoroughly possessed with the determination that all parts of her domain shall be covered with good roads, and their great desire is that her legislators shall more fully add the wealth of its overflowing coffers to their endeavors. By no means can the State add more rapidly to its wealth than by employing its bounty to tempt its citizens to contribute of their surplus to jointly improve its highways. Then over them will flow much of the wealth of the great cities that lie within and without its borders, until it permanently abides upon her hilltops in the shape of residences and beautiful grounds, and its fertile farms become productive gardens where the necessities and luxuries of the temperate zones are raised in profitable abundance.

BENEFICIAL EFFECT OF THE STATE AND COUNTY AID FOR IMPROVEMENT OF ROADS.

The general mission of the government is to protect its citizens, insuring them life, liberty, the pursuit of happiness and free and unmolested action in their daily occupations. Besides the exercise of these powers many governments have assumed other functions, the bestowing of bounties and the levelling of duties upon important articles. The offering of bounties resulted in the rapid development of particular industries, noticeably among these the manufacture of sugar from beet to such an extent that it has become a formidable rival of the cane products of tropical countries, and insured a low price to the consumers of all nations. Many enterprises thus protected have become exceedingly remunerative, and with the economy practiced have been in the end able to stand alone, competing successfully with the whole world. So when governments have turned their attention to the building of hard roads, the patronage of States in many ages has perhaps produced more wonderful results than duties levied or bounties bestowed for the development of different industries.

In all great systems of road building the States have been the foster fathers. Darius, the great ruler of the Persian empire, connected the eastern and western frontiers of his empire, twenty-seven hundred miles apart, with such a splendid system of military roads that couriers could make the whole distance in ten days when common roads would require many months. The great empire of Alexander was made possible through these roads which he carefully managed to keep in the same condition. The great highways of the Romans, numbering many thousands of miles, many of which have endured for ages, were the strongest bonds in the development and maintenance of their empire. The improved roads of England, France, Germany and other States in Europe were largely the creation of their respective governments and are still fostered and maintained by the same agencies. So in this country experience proves that the construction and maintenance of good roads, by the appropriation of public funds for that purpose, have been eminently successful. The people realize the advantage they gain from these undertakings, and are more than willing to pay the taxes necessary to meet the bounties of the different States. They find their return in reduced

cost of transportation, easy traveling, business facilitated, free rural postal delivery made practical, the value of land increased, the attendance of the school and church noticeably enlarged and the rural communities elevated to a higher level in the scale of civilization.

DEMAND FOR ROAD REPORTS.

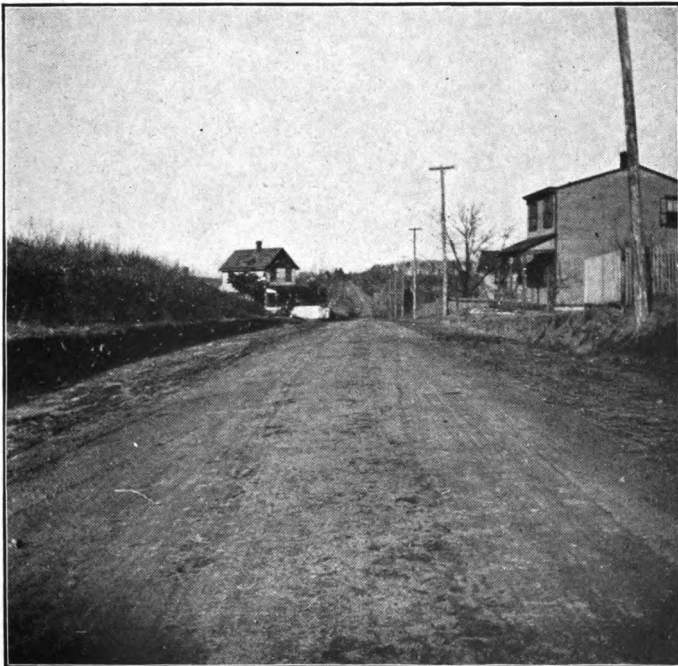
One of the evidences of the great interest manifested in road improvement in New Jersey is the great demand for our reports from all sections of the country. The number printed has been increased each year and yet there is always an inability to supply the number demanded. We have requests from Generals, many subordinate officers of the United State Army, down through the engineering corps of the same, from the engineers and officers building roads in our new possessions, from the many road improvement associations, from municipalities, from Senators, Representatives in Congress, from members of the different legislatures of the United States and Canada, from foreign countries, from engineers in all sections of the country, from the geological surveys of the different states, from numerous libraries and from citizens of every rank and condition. The lengthy notices given our work and reports in the engineering journals and leading daily, weekly and monthly papers of the Union, always bring a flood of requests for our reports, all of which makes a heavy draft upon our postage account, swelling it to several hundred dollars per year. This shows the necessity upon the part of our Legislature to increase our expense account, in order that we may be able to meet the increasing demand for our reports and the expense in other directions made necessary by the growth of our work.

ACQUISITION OF TOLL ROADS.

When the State aid law took effect there were many miles of toll roads in New Jersey, principally located in Atlantic, Burlington, Camden, Mercer, Gloucester and Monmouth counties. At the session of the Legislature in 1897 there was an act passed, "To provide for the acquirement of turnpike roads for free public use." Under this act commissioners appointed by the Governor placed a valuation upon



Haddonfield and Magnolia road, Snow Hill, Camden County. Eight-inch Macadam.



Haddonfield and Magnolia road, Snow Hill, Camden County, looking towards Haddonfield.
Eight-inch Macadam.

toll pikes, which valuation, if approved by the State Road Commissioner and accepted by the freeholders of each county, would call from the State one-third of their valuation and from the property holders and petitioners the remainder. Under this provision commissioners were appointed to assess the value of one turnpike in Monmouth county and two turnpikes in Burlington and Camden counties, each passing through portions of these counties. Only in Burlington county have the valuations been accepted by the freeholders. The valuations of the remaining portions of these pikes in Camden county have been held in abeyance by the freeholders. During the pending of the negotiations for the purchase of the Keyport and Holmdel turnpike, the Monmouth county freeholders decided, independent of state aid, to buy and make free all its toll pikes. This year they have placed twenty miles on the free list, at a cost of \$40,000, so all necessity for the State Aid Turnpike law in this county has passed.

In Camden county the prospect does not seem very bright for the acceptance of the commissioners' valuation. This law failing in its workings to satisfy the freeholders, a new law was passed at the last session of our Legislature, 1901. This law allows freeholders to purchase any turnpike at agreed valuation, then if the State road commissioner approves of the purchase, the State becomes bound for one-third of the cost. Under this law an agreement was entered into by the freeholders to purchase a pike five miles in length in Atlantic county, leading across the meadows from Pleasantville to Atlantic City. This purchase your commissioner declined to approve of because, after careful inquiry, he discovered the price was far in excess of its real value, and much more than a new road could be built for. So the two laws for the acquirement of turnpike roads for free public use have so far failed to accomplish intended results. We would, therefore, advise that corporations owning toll roads should either place them in the same condition as the State roads or abandon them, as has been done this year with two important pikes in Burlington county; or the county should purchase them independent of State aid, as they have done in Monmouth county. Then when the the residents along the line desire to have them more thoroughly improved, they can petition to bring them under State aid. By this action the progress of making them free roads will be much more rapid, and in the end they could be placed in much better condition than if they were purchased by the State and county under either

of the free turnpike laws. The sooner they are made free roads the better it will be for the present owners, for free State roads are, in many cases, being constructed in such relative positions to toll roads that the travel is being diverted from them. Residents along toll roads pay taxes to make free roads, and therefore, should not be again required to pay another tax in the toll exacted. So hasten the day when toll roads cease to be factors in the transportation problem. There are probably not more than fifty miles of toll roads in the State of New Jersey, and these are principally in the three counties of Burlington, Camden and Gloucester. The sooner they are eliminated the less complicated will be our road problems.

HINTS TO FREEHOLDERS AS TO WHAT CLASS OF ROADS SHOULD
RECEIVE STATE AID.

In the State of New Jersey there are twenty thousand miles of roads independent of city streets. This would make about one thousand miles to each county intending to avail itself of the State aid bounty. Under the present State appropriation there can be built on an average not more than one hundred miles per year. This, if all the counties were building alike, would allow but five miles per year to each county; or, if the appropriation were double, ten miles per year; therefore, under present rate of construction it would require from one hundred to two hundred years to cover all the roads in each county with stone or gravel.

These facts are recited to show that it would be impossible during any one generation, under the present law, to improve more than a small fraction of our common roads. Hence, the necessity arises for freeholders in each county to take some systematic action for first improving their leading thoroughfares. By this plan all parts of each county would be sooner benefited.

In order to quickly materialize this idea the freeholders should have maps of the roads of each county, so they could study their relative importance, and plan that only those roads that lead directly across their county to and from important towns should first receive their approval. When these lines were finished they could, with propriety, consider the feeders to them. There are often great efforts made to devote the State and county funds to relatively unimportant roads.

Petitioners who have the best pull, either magnetically or politically, sometimes succeed in having their roads receive first attention, and thus secure lines that benefit only a few and do not make connection with continuous improved lines. If the freeholders were to pass ironclad resolutions deciding that only trunk lines should first receive aid, all temptation to yield to persistent importunities would be removed, then all suggestions for the improvement of side streets for the benefit of a few land speculators, or those who promote only for personal aggrandizement, would be nipped in the bud. All improvement, whether by county or State, should be made as general as possible, thus giving the largest good to the greatest number. All legislation should be such that in its enforcement personal influence could have little effect. All laws should, as near as possible, be framed on the model of those ruling the universe; these, it matters not whether we seek or not to interfere with their workings, keep "grinding out the will of the gods."

THE MILLENNIUM OF ROADS.

A period when road makers will have reached the heavenly state will be when crushers will furnish the stone in uniform size, when contractors will learn to use proper material, when worn-out dirt, red shale and stiff clay for binder are shunned as the righteous shun evil ways; when only coarse sand, ferruginous gravel, moulding sand and stone screenings combined with stone are allowed to enter into the composition of the roadbed.

When freeholders will establish a uniform system for the care and repair of the roads.

When freeholders will cease to each care or not care for the roads in their respective townships, so that when a road runs through several townships, one freeholder covers his portion with sand, another his portion with gravel, another with clay and another does nothing until he gets through with his farm work, thus allowing it to ravel and lose millions of stones and lame the horses that travel over it.

When freeholders will appoint a supervisor for each county whose whole time, by constant inspection, shall be devoted to watching every break, in order to remedy it as soon as it occurs, and not wait until a more convenient season, when personal business is disposed of.

REVISED ROAD MAP FOR 1902.

We have revised the map that accompanied our Seventh Annual Report for 1900 by adding all the roads improved in 1901, also the free gravel roads built by the municipal authorities along the coast, and the gravel roads bought by the counties during the year. One of these maps is attached to each report of 1901.

This map shows all the improved roads in the State, the turn-pikes that have this year been made free roads, and many gravel roads that are in fine condition for rapid traveling. The free roads are marked in red and the toll roads are dotted in the same color.

The map presents at a glance the extent of road improvement in New Jersey, and gives the intending traveler an opportunity to select the best routes between any particular points.

By means of this owners of automobiles, bicycles and pleasure carriages of all kinds can intelligently travel through any portion of our State.

THE NEED OF ENGINEERING SKILL IN ROAD BUILDING.

By Robert A. Meeker, State Supervisor of Roads.

The main object aimed at in all road improvement is to furnish a highway over which we will be able to move the greatest weight, with the least expenditure of power, in the shortest period of time. The idea, unuttered or expressed, that a hard, smooth surface is the one and only thing required, has so thoroughly permeated the minds of the people that everything else is lost sight of; while it is beyond dispute that a hard, smooth surface is a prime requisite, yet there are other things just as essential to the attainment of the desired end that must be done before the surfacing is applied.

The first thing to be considered on an old road is not, what shall we use for our road covering, but how shall we overcome the steep grades found on our hills, and how shall we get rid of the water lying on our plains; thus at the very outset we are met by the great problem of grades. The questions, How much shall we cut our hills? How much shall we fill our hollows? are the first and most important ones to be answered, because, upon the decision reached on these

points, depends the future life and measure of usefulness of the improved road. The old rule of thumb must be thrown aside and exact information obtained and acted upon if we are to have permanent and satisfactory results, *i. e.* get our money's worth.

We will first consider the old road as we find it, running through a settled farming community. Its course is crooked, often turning aside from a direct line to climb a hill, on which some house is perched like a great bird overlooking the surrounding country. In fact it was for that very purpose of guarding against surprise that the site was selected in the days when the wily indian roamed through these hills and valleys. The indian has gone, the house remains a magnet to draw the road away from its—for the time being—direct and comparatively level route. Let us not criticise the old road, with its windings, its hills and hollows, too severely; it served its purpose, that of affording a means of communication between one settler and another and finally with the county seat, in the days when time was no object, when no one was in a hurry, when each pursued the even tenor of his way, when the locomotive, the telegraph, the telephone and the trolley were unknown; but while science and invention have changed every other feature of our life, the old road remains, a relic of days that are gone. How shall we change it? How shall we improve it so that it may conform to the needs and requirements of this hurrying age? The natural answer is, use the knowledge that we have gained by experience in other branches of endeavor. Naturally we look to the railroad. In its first stage it consisted of straps of iron nailed on stringers which were supported on ties, laid on the surface of the ground, up hill and down. But it soon became evident that the locomotive could not haul its load up the hills. The train was cut in two, one-half was hauled over the hill, then the engine returned for the remainder; but too much time was lost by this method, and it was found to be much cheaper in the long run to cut down the hills and fill up the hollows, thus the value of easy gradients was soon demonstrated. No one thinks for an instant that our railway officials spend thousands of dollars in making deep cuts and high embankments, without first carefully counting the cost and satisfying themselves that it pays. Such being the acknowledged fact, it behooves us to profit by their experience and so grade our public highways that the farmer, truckman, fruit raiser, manufacturer and business man, away from the lines of railroad, may

reach the same quickly at all seasons of the year, with as large and heavy a load as possible; also that the city business man may be tempted to locate in the country, and thus distribute in the rural districts some of the wealth that he has accumulated in the busy marts of trade. If we wish to attract the latter class we must give them roads over which they can trot their horses all the way from the railway station to their homes. I say *trot* their horses, for that is what they wish to do. There is something so exhilarating in driving a good horse over a good road at a good pace that there is no danger that we will soon reach the horseless age. The prophecy that the death-knell of the horse has been sounded has been repeated so often, upon the appearance of every new mode of locomotion, and has proved false, that we are perfectly safe in predicting that the horse will remain the most faithful servant of man for ages to come; such being the case it behooves us to make our highways as good as possible, in order that he may render us the greatest amount of work with the least expenditure of effort, so that his days of usefulness may be prolonged and we receive a good return, not only in dollars and cents but also in pleasure, on our investment. The bicycle and automobile have also come to stay; the first is recognized as an established means of locomotion, the second is fast becoming so. The motto of the twentieth century is, "Get there, and get there as quick as you can," and we must build our roads to meet the demands of the times, *i. e.*, with a smooth surface and easy grades.

Having these facts clearly before our mind's eye, we are ready to devote some time and thought to the business of grading our roads. The first question naturally is, What is the maximum grade we should allow on our roads? To answer this properly we must divide our roads into three classes, corresponding to the topographical divisions of our country, *viz.*, level, hilly and mountainous. Level roads should never have a rise of more than three per cent., that is, of three feet in a horizontal distance of one hundred feet; on these a horse can trot up hill and down with ease and safety. Hilly roads should not exceed five per cent., and that not for any great distance, and mountainous roads should be kept below ten per cent., both on the score of economy and safety.

Gen. Gillmore's rule that "the grade should not be so great as to require the application of brakes to the wheels in descending, or to prevent ordinary vehicles, carrying passengers, from ascending at a

trot," is a good one, and may be applied to even mountain roads except on a few stretches where the cost of grading would be excessive.

In addition to the above a road should never be so steep that a wagon in a state of rest would be set in motion by its own weight. The grades, therefore, suitable for any road, will depend upon its condition with respect to smoothness and hardness of surface; that is, the smoother the surface the less the grade should be.

Many experiments have been made in this and other countries to determine the amount of tractive force required to move a vehicle along level roads of varying degrees of hardness and smoothness and covered with different materials. A summary of these experiments prove that the amount of force a horse will have to exert in pulling a load of one ton of two thousand pounds will be as follows:

| | |
|--------------------------|--------------------|
| Over a macadam road..... | 40 to 58 pounds. |
| Over a dirt road..... | 125 to 268 pounds. |

The latter figures show at a glance why grades were considered of so little importance. The hills, in bad weather, were always the best portion of the dirt road, and any load that could be hauled through the mud of the level sections, could be pulled up the hills; but when these same roads were macadamized a different set of conditions sprung up. The teamster soon learned that he could haul three times as much as before and loaded accordingly; everything went smoothly until the hills were reached, then the trouble began; the horses were stalled. The driver urged them on with voice and whip but to no purpose; they could not haul the load up the hill. Finally after losing both time and temper, a portion of the load was thrown off, the driver went on with the remainder, and, upon reaching his destination, had to unload and return for the portion thrown off, thus consuming double the time he should have done had the road been properly graded. The foregoing is no fancy sketch, but has been the actual experience of many on the first roads built in New Jersey, under the State aid law, when a hard, smooth surface was supposed to be the only thing required.

Another fact that makes the question of grades of the first importance is that after a road is macadamized it is very difficult to persuade the officials in charge to change it. The hard, smooth surface seems too good to tear up, and thus the people have to grumble and bear it. The cheapest time to grade a road is before it is improved, and so well

has this lesson been learned that in some counties, where the funds are limited, they grade their road one year and macadamize it the next.

For another reason proper grading is very important, *i. e.*, a properly graded road lasts much longer. On a steep hill the rapid flow of water carries away all of the fine material from the surface and then tears the larger stones out of their bed, necessitating many and frequent repairs. On long, level stretches where no provision has been made for the carrying off of the water the results are as bad if not worse; the water, failing to find an outlet from the side ditches, soaks under the foundation of the road, softening it to such an extent that passing wagons force the stones forming the road covering down into the dirt beneath, the road becoming cut into ruts and holes to such an extent that the cost of repairs equals that of first construction.

From the foregoing it is readily seen that a preliminary survey, showing changes in elevation, the location of streams, the different courses of the road, its width, and in fact, giving the exact condition and position of the road intended to be improved are of prime importance. Having this information, we can study the road as a whole and determine, without costly experiment, what to do and what to leave undone.

The cuts must balance the fills if possible, if not, borrow pits if we need more dirt; and dumping ground, if we have too much, must be located before we begin. The nature of the soil along the road must be carefully noted, in order that we may be able to specify the quantity, size, thickness and width of the material or materials to be used, also the area and conformation of the country that sends its water into the gutters of our road, in order that we may determine the location and size of the bridges, culverts or pipes required.

If we take time to do these things before we commence building our road, we will obtain a better, cheaper, more durable, and, in every way, a more satisfactory improvement.

Better, because the thickness and kind of pavement have been carefully determined with reference to the nature of the soil which forms its true foundation, and the quantity and character of the traffic that is to pass over it.

Cheaper, because the quantity of work to be done and material furnished is definitely specified, and the manner in which it is to be

applied clearly stated, enabling contractors to figure more closely and allow less for contingencies.

More durable, because from the foundation to the finishing course each component has been so proportioned that it is equally strong and durable as the other.

More satisfactory, because each element of the road has been treated as part of one harmonious whole, thus forming a road that is an improvement from beginning to end.

This last is by no means the least of the objects aimed at, it is in fact the great end and aim of our endeavors as good advocates. A satisfied public is our greatest endorsement; if we please the people they are with us, and if the public is with the advocates of any reform, those advocates will succeed.

A satisfied public is the strongest argument that can be presented in favor of good roads.

SOMERSET COUNTY ROADS.

"SOMERVILLE, NEW JERSEY, October 15th, 1901.

"Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, New Jersey:

"DEAR SIR—Answering your communication of October 10th, would say the following points have been developed in my experience in road building in Somerset county, especially during the past year:

"I find that our roads have stood the test of time in a most satisfactory manner, particularly in view of the slight care, attention and repairs they have subsequently so far received. The wear and tear upon most of these roads have been constant and very heavy. One of the most deplorable features of road building is the seeming indifference of the proper authorities to repairs actually needed. For the thirty-three and one-half miles of improved roads in this county, no county supervisor of repairs has hitherto been appointed. It goes without saying that the best and most carefully laid road will, within a comparatively short time, become seriously impaired if it receives no attention. Yet in how few instances do we find provision for systematic oversight and repairs. But roads, if constantly neglected, will not last forever. This goes to show that our roads were originally well built. I find that in a few instances the top dressing has washed off in spots and almost disappeared, caused unquestionably by the poor quality or slight quantity of binder employed. I consider a judicious

use of binding material efficacious. Good binder is valuable, not merely as a sort of cement to keep and hold the stones together, but on account of the difficulty to saturate. Nothing short of heavy and protracted rains can make any impression thereon. The few instances before referred to, wherein washings have occurred, may, I am positive, be traceable to the inferior binder applied at that spot and vicinity, and such procedure is occasionally unavoidable. First-class binder is not so generally available as may be supposed, and, in such event, recourse is often had to the most readily accessible material. Contractors are prone to take advantage of too free a use of binding material, and supervisors should be more vigilant and exacting in the discharge of their duties during construction.

"Too great a curvature to the road is conducive to the washing of the surface dressing. Yet such curvature is in most cases not excessive, considering the side drainage, for the bottom of the side ditches must be below the level of the sub-trench or the water will naturally seep in, consequently underdraining the stoneway without chance of escape. No curvature less than one inch to the foot will bring side ditches of a thirty-foot road below the bottom of the stone trench. The law should be so amended as to call for roads not less than thirty-three feet wide, so as to have ditches low enough to prevent the water from percolating into the sub-trench.

"Somerset county has been slow to avail itself of the beneficent provisions of the improved roads law, but the public is now awakened and applications under such law are now being constantly received.

"Among the practical results of the operation of this law is the fact that fewer spavined horses are now to be found in this county. Loose stones may occasionally cause temporary lameness, but fewer horses in the vicinity of stone roads are now permanently injured through travel. Communication between different parts of the county has been very materially facilitated, and, so far as the traveling public is concerned, seldom has anything short of great satisfaction been expressed with our stone roads.

"By way of suggestion I would recommend that the supervisors of construction, designated by the property holders, be men of good judgment untrammelled by party affiliations, instead of men owing their appointment to political influence. The present mode of appointment results in men of no experience in this line, who begin to learn by the time a road is about completed what their duty to the

county really was. An efficient supervisor of construction is of great assistance to a county engineer. It is our experience, in Somerset county, that an engineer must too frequently instruct not only the contractor how to build roads, but the supervisor as well.

“Respectfully yours,

“JOSHUA DOUGHTY, JR.,

“*County Engineer.*”

ROCKS FOR ROAD BUILDING.

By Joshua Doughty, Jr., County Engineer of Somerset County.

A fair knowledge of the chief properties of materials is essential to the successful road builder, particularly with regard to their capacity to sustain and their resistance to wear and tear. It should be the aim of every road builder to ascertain what materials are preferable for construction purposes. To one seeking information as to road materials, their properties and characteristics, some account of their geological origin and history is evidently appropriate.

Geologists so inform us, and it appears to be a fact now established beyond reasonable question, that at some period far remote the globe was in a state of liquefaction from heat, and that it cooled by degrees.

Our knowledge of the *inner* portion of the earth is limited, but the *surface*, called the crust, has been studied with profit. The opposite principles of fire and water have always been and still are responsible for the continual changes to which the crust of the earth is liable. This crust is composed not of a single piece but of various materials called in general *rocks*. The substances of which we have any knowledge are properly divided into four classes, viz., plutonic and volcanic rocks, both of fire origin, but produced under different conditions; stratified rocks, due to the action of water, and metamorphic rocks, deposited by water, but subsequently changed and crystalized by heat. Observation shows that the plutonic rocks, comprising the granites and porphyries, originated in the deep and fiery caverns of the earth of molten matter which crystalized as it cooled slowly under tremendous pressure and was then heaved up in masses by the elastic force of the internal heat, even to the summits of the loftiest mountains, or injected into fissures and cracks of granite previously formed; for granite was not all formed at once, some portions having been solid while others were still in a liquid

state. Rocks of this class contain no vestiges of fossil remains and metamorphic rocks very seldom.

Granite and the volcanic rocks are both due to the action of fire, yet their nature and position are very different. Granite, fused in the interior of the earth, has been cooled and consolidated in coming to the surface, and as it has generally but few ingredients it presents nearly the same character in all countries. The ancient portion of the crust of the earth consists of granite and of some other rocks which appear to be likewise of igneous or fire origin.

The name *granite* is given by geologists to a rock composed of a confused agglomeration of crystals formed by distinct materials, some of a glassy appearance are known as quartz, others as feldspar, and still others as mica. Granite presents no evidence of stratification but all the characteristics of an igneous origin, and is met with in different parts of the world, and is employed in the erection of edifices of various descriptions.

Gneiss is a rock similar to granite in its constituents, but appears to have been formed under somewhat different circumstances and is used for buildings and flagging.

Granite consists of a quartz, mixed with one or more of the feldspars and hornblend or a mica. Hornblend has essentially the same composition as augite which occurs in trap-rock. *With* hornblend, granite should be good road material; *without* hornblend it has less binding power. The quality of granite is affected by the foreign minerals which it may contain. Hornblend renders it tough; schorl or tourmaline makes it brittle; sulphurets and other chemical compounds of iron are injurious in their effects in granite by destroying the structure of the stone and causing it to break up and disintegrate. Granite has usually a smaller binding power than trap-rock due to the form in which the quartz occurs, so that for road building purposes trap-rock should, as a rule, be preferred.

Greenstone or trap-rock is a mixture of hornblend with compact feldspar, presenting a granular but generally compact texture. It is, when dry, usually of some shade of brown, but if wet, assumes a greenish hue, whence the name. It is very hard and durable; as it is liable to break into small and irregular blocks, its uses as building stone are limited. It derives its name of trap-rock from the Swedish word *trappa*, meaning a flight of stairs, because trap-rocks frequently occur in tabular masses rising one above another like the consecutive

steps of a staircase. It is of first-class value for road making and for constructing wharves on account of its resisting well the action of salt water. Trap-rock is found, by experience, in New Jersey far superior to other materials for road uses, especially for the wearing surface of roads, though other rocks may be employed for the sub-structure and filling.

In the abrasion tests made by the Massachusetts Highway Commission the co-efficient of wear for some trap-rock, from Somerset county, was as high as 24.39, while that for granite showed 16.46, 20 being assumed as the standard.

Trap-rock possesses to a high degree a binding or cementing power. The dust produced by wear unites when moistened quite firmly, forming a sort of cement, which binds the larger fragments to a considerable extent. It is so closely connected with sand-stone that there appears from geology to be some connection in origin between water-made and fire-made rocks. The proofs that trap-rock comes up through fissures in a melted state are numerous, for the wall-rock of the fissures is often baked so as to be very hard and is some times filled with crystalization due, evidently, to heat. Where forced up through fissures in granite the two walls of granite are found intact, showing that at some time the granite has separated to allow the molten trap to ascend and exude.

Trap-rock is quarried in immense quantities in parts of New Jersey every year; consumed largely for road purposes. Quarries are opened and crushers in operation in many portions of the State. The tendency of prices for crushed trap-rock has been downward, but the volume of business has been steadily upward.

The superiority of trap-rock for use on roads seems to be much more generally admitted than formerly. Some of the New Jersey trap-rock crushes at about 40,000 pounds to the square inch; granite at about 24,000 pounds. If granite is used for road purposes it is liable to be crushed by a ten-ton roller. Protracted rolling with a heavy roller is apt to wear off the edges of the coarser stones and is not, consequently, advisable. Yet, as a matter of fact, the roller is used too seldom rather than too often. Reasonably frequent use of a lighter roller is preferable during construction to the use of a heavy roller.

The more productive counties for trap-rock are Somerset, Hudson, Essex, Sussex, Passaic, Mercer and Hunterdon, with considerable amounts from Union and Morris counties.

An analysis of good trap-rock for road construction shows as follows:

| | |
|-----------------|-----------------|
| Silica | 50.03 per cent. |
| Aluminum | 18.20 per cent. |
| Iron Oxide..... | 16.81 per cent. |
| Lime | 11.10 per cent. |
| Magnesia | 1.02 per cent. |
| Alkalies | 1.03 per cent. |
| Water | 1.81 per cent. |

| | |
|-------------|--------|
| Total | 100.00 |
|-------------|--------|

COST OF TARRED ROADS.

• "OFFICE OF BOARD OF PUBLIC WORKS,
"CITY OF GENEVA, N. Y., December 11th, 1901.

"The Hon. Henry I. Budd, State Commissioner of Public Roads:

"DEAR SIR—Replying to yours of October 16th, in regard to tar macadam roads, will say that we have constructed over 17,000 yards of such pavement in this city this season, the construction of which was as follows:

"The subgrade was prepared as for an ordinary macadam pavement. Upon this subgrade we placed a very light layer of 2" stone of sufficient thickness to just cover the subgrade. This layer of stone we sprinkled and rolled into the subgrade, thereby making a solid foundation for our road proper. Upon this we placed 5 inches of 2½" stone, rolled down to 4", voids completely filled with screenings. This course was treated in the same manner as one would treat the top course of an ordinary stone road, being rolled until a perfectly solid and smooth surface was obtained. Upon this layer we put 3 inches of tarred stone. The stone averaged in size from ½" to 2½". This stone was heated just sufficiently to drive out the moisture by passing through sand drums, and was mixed with the tar in a regular asphalt mixer, using about 16 gallons of tar to the cubic yard of material. This material was drawn on the street and rolled while hot, using a five-ton roller. After this was thoroughly rolled, we put on a top dressing composed of ½" stone screenings, including the dust mixed one to one with fine sand. This material was also heated and mixed in a mixer with 39 gallons of tar to the cubic yard of material. This top course was heated to about 250 to 300 degrees, taken to the street, spread on the tarred stone while hot to a depth not

exceeding one-half of an inch. This was rolled while hot with a five-ton roller. This rolling was continued until the tar flushed up to the top, making a perfectly smooth surface. Upon this course we spread limestone screenings very lightly, just sufficient to cover all portions of the pavement, and this was also rolled with a five-ton roller, which completed the construction of the pavement, which when laid one day was thrown open to travel the next. With this construction we get a smooth, level surface nearly equal to an asphalt surface although not as slippery as asphalt. We have one street that has now been open to traffic for about three months which is giving the best of satisfaction. The feature of this construction is that you have no mud or dust as with an ordinary macadam roadway. We used about two gallons of tar to the square yard. Cost of same, exclusive of curbs and drain tile, was about \$0.90 per yard. Labor at \$1.50 per day, and stone about \$1.50 a cubic yard delivered on the street.

"Yours respectfully,

"E. SEYBOLT, *Supt.*"

For the instruction of those who have the care and maintenance of our roads, we print the following articles, gleaned from various sources, describing how roads are repaired in different countries.

FRANCE.

Americans make the mistake in road building of studying the question solely from a physical and constructive standpoint rather than from one of organization and systematic operation. Where we have bad roads we are disposed to criticise them from a constructive standpoint. If a road fails, we say that it is because it is not well built; because the right material was not used. In this our view is superficial. Organization, system, constant and uninterrupted care, a vigilant road patrol are required for the purpose of immediately detecting and remedying the slightest defect. *The cheapest way to care for a road is by never allowing it to get into a bad condition; by never allowing it to deteriorate in the least. A road properly cared for gets better every year.* It improves constantly. This is the way to make a road. The most systematic, the most economical, the most painstaking road builders are the French. They have better roads, at a

less cost, than any other nation. Their results are ideal both from the standpoint of cost and the character of the roads. They are a people heavily burdened with taxation. With them economy is necessary; it is the saving born of necessity. It is the kind of economy that, among other things, develops the perfect roadway.

What is its method? Constant and systematic inspection and care. "Memorandum for the Road Viewer," is a book of about two hundred and fifty pages, and contains detailed instruction for the care of roadways in France. It provides for a regular and systematic patrol of the roads and all works connected therewith, viz., bridges, culverts, ditches, drains and their dependencies. In France most of the roads have been made of macadam, though many are of cobblestones, particularly in the northern part of France.

In the south most of the roads are macadam, and are altogether pleasanter and more satisfactory for general travel. During all the time of their existence they have been subject to constant inspection and repair as soon as the slightest defect has shown itself. *One man with a horse and cart can care for many miles of roadway when he has nothing else to do, and when he undertakes the work before the imperfection is great.* When we wait for our roadways to be cut to pieces, to reach an almost impassable stage before we do anything for them, the work of repair is laborious and expensive. With constant inspection there is required only a few shovelfuls of broken stone for each little defect. In France all roads are again subject to the general inspection of a general road officer, who holds his subordinates responsible for results, and makes reports upon the improvement of bridges, drainage and affairs of this character. Any defect, of however slight a character, in any roadway comes about through some one's neglect. Through the perfection of the organization in France it is entirely possible to place the responsibility. For this reason, neglect of duty is a rare occurrence.

The French macadam roads, roads made of broken stone, are of the ideal character, smooth, reasonably permanent and best suited to the comfort of the horses and animals which travel over them. A macadam roadway is in every way ideal when we consider it with respect to the comfort of those who travel over it. It is even a question in the minds of many engineers if a macadam roadway is not superior in all ways to asphalt, wooden-block, stone-block or other artificial street coverings.

A chief engineer is at the head of each department, and he has several assistant engineers, each in charge of a subdivision called an *arrondissement*. All the roads in these *arrondissements* are visited and examined by them at least quarterly, and oftener if necessary. These engineers in turn have lieutenants, called conductors, who oversee certain lengths of road, which they must look over in detail at least semi-monthly. Under the conductors come the *cantonniers*, who do the manual labor, each one caring for a *canton*, or a stretch about two miles long. Five or six *cantons* are grouped together and their *cantonniers* form a brigade one of whom is made chief, and has a shorter stretch to care for in order that he may oversee the others. If a piece of road absolutely requires it, one or more laborers, called auxiliaries, are given a *cantonnier* to aid him.

Besides overseeing their roads the conductors give all orders to the chief *cantonniers*, examine their work and report on their conduct and make written reports to the engineers twice each month. They keep the accounts of their divisions and report on petitions or new projects. They are obliged to do all their traveling on foot, examine into the smallest details and give the necessary explanations and directions to the *cantonniers*.

The *canton* of the chief *cantonnier* must be the best kept of the brigade, in order to show his superiority over the other men. These men are nominated by the prefect of the department according to certain conditions: They must be between twenty-one and forty years old, suffer from no infirmity that interferes with daily labor; have previous experience in workshops appertaining to their work or have worked on the roads in some capacity; possess a certificate of good conduct and be able to read and write.

The *cantonniers* must remain on the roads from sunrise to sundown in winter, and from 5 A. M. to 7 P. M. in summer. They are allowed to build shelters or have movable shelters in which they can seek refuge during storms, but they cannot absent themselves from the roads. Each one has an account-book and a register, and keeps a daily account of his work and the time occupied in each task. At the end of each month the conductor recapitulates the account and sends it to the engineer.

In this way the roads are never without the most careful attention, and expensive and annoying repairs are rendered unnecessary.

"DRESDEN, SAXONY, October 10th, 1901.

"Henry I. Budd, Esq., Commissioner of Public Roads, State of New Jersey, Trenton, New Jersey:

"DEAR SIR—In response to the request contained in your favor of the 20th ult., I desire to state that, except France, no country in Europe enjoys better public roads than the kingdom of Saxony. This is no doubt due to the fact 'hat the country is old, but careful construction and constant repairs have much to do with reaching this result.

"The width of our roads vary from seven to eleven yards, the important highways being usually eleven yards wide. When the road has been profiled, drained and graded to the desired level and width, the large stones for the packing layer are lain, and this must form a solid resisting body, equally thick, and perfectly smooth on its surface. To secure proper drainage transverse trenches are dug, twenty centimeters long and fifteen centimeters wide, at intervals of eleven yards under the packing layer, and these trenches are filled with broken stone. This surface is then rolled by a steam-roller until it is compact and smooth.

"Whenever practicable the road is built above the level, with side ditches fifty-five one hundredths yards deep and usually forty-four one hundredths yards long. On the packing layer is placed screened broken stone, and this superstructure again rolled without moisture. The last covering consists of sand and gravel, and while this is being rolled it is *constantly soaked with water*, forming a surface *smooth and durable, almost equal to cement*.

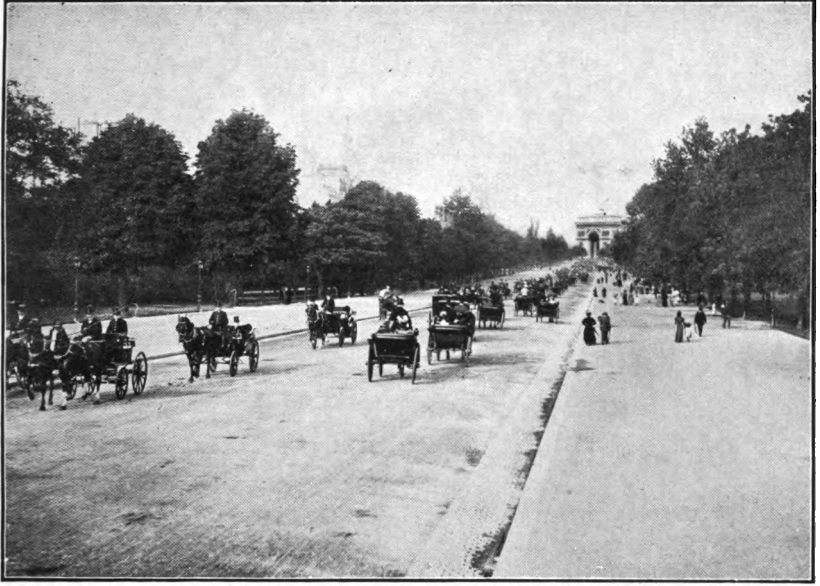
"I have been interested in seeing the diligence and persistency with which this rolling process is accomplished, and am convinced it is much more thoroughly done than is customary with such work in the United States.

"Finally, repairing is done immediately upon discovering any break or rut, and I have seen workmen renewing portions of a road that seemed in better condition than the highways of my native commonwealth, the keystone State.

"Yours truly,

"CHARLES L. COLE,

"Consulate-General of the United States of America."



Macadamized road, Avenue de Bois de, Boulogne.



Macadamized road, Saxony.

THE ROADS OF JAVA.

The roads of Java are by all odds the best of any country of the world, and that notwithstanding Java is on the edge of the equator in one of the rainiest parts of the globe.

What is needed more than anything else for the development of the Philippines and Porto Rico is good roads. The Dutch found Java much as the Philippines are now. They organized a system of road building and forced the natives to carry it out.

A certain amount of labor had always been given to the chiefs by the natives. This labor was applied to road building. Each man was required to work so many days a year on public improvements, and the result is the good system of highways found in Java to-day.

Most of the roads are macadamized. They are ballasted with broken stones, ground to the size of a nut, and rolled smooth with heavy iron rollers.

Each side of the road has its gutter in which there are openings every here and there for the water to flow off. The road drainage is perfect.

There are culverts under the highway, and in some places, in order that the irrigation system may not be disturbed, the streams are carried across high above the roads.

During a ride with Controleur de Groot, of Bandung, I passed many piles of volcanic pebbles which had been gathered from the streams and brought to the roadside. I asked what they were for and the Controleur told me that they were for repairing.

He pointed out that each pile bore its number and that the controleurs knew to a cubic foot just how much each contained.

This ride was behind a team of high-stepping ponies on a road as smooth as a floor, shaded with tall kanari trees which interlocked their branches overhead, making an arbor many miles long.

So far I have not found a road that is not shaded. Some of the trees grow to a height of a hundred feet, and a walk is not unpleasant even at midday.

At short distances there are rest-houses or police stations, little shelters about six feet square with tiled roofs upheld by white pillars.

Each shelter has a wooden drum, and the patrolmen are required.

to pound upon this every time they pass during the night. The roads are thus watched all night long by native guards armed with knives and lances; they are supposed to protect the houses and travelers.

Every native must give two nights a month to road watching, and two days every month to work on the road, so that on the average each native gives a day every week to road work.

Some of the officials think this too great a hardship to the people, but the older Dutchmen say that it is through this that Java has been made the prosperous country it is, and that it must not be changed.

FRANK G. CARPENTER,

U. S. Consul.

PORTO RICO.

Major Hills, who is a graduate of the United State Military Academy, and ex-officer of the 3d Artillery, and a member of the American Society of Civil Engineers, assumed charge of the road department several months ago.

Formerly the municipalities were responsible for the condition of the country roads. No repairs had been made for years, and the roads were full of rocks and boulders, ruts and ditches—in fact, absolutely impassable.

The first thing that the new director did was to systematize his work as follows:

1. Selection of roads to be built and repaired.
2. Organization of the laboring classes.
3. Instruction of the laboring classes.
4. Disbursement of funds so that the money should be paid directly into the hands of the laborer.

The men employed were divided into gangs of twenty-five with a foreman, an overseer being in charge of the gang on each road. Overseers were classified and placed under superintendents. The whole island was divided into two districts—northern and southern—with an engineer in charge of each district. This organization has so far proven very satisfactory.

At the end of the last week, according to the statistics gathered, sixty-two roads were being rebuilt or repaired, and fifteen thousand

men were on the pay rolls of the department. Laborers are paid fifty centavos a day, and eight hours constitutes a day's work. Payments are made regularly twice a month.

The construction of these roads is intended to be of a permanent nature. They are first graded and ditched and then covered with stone, very much the same as is done in the United States.

In selecting roads for repairs, Major Hills has been careful to first open main arteries of communication into the interior to facilitate the transportation of crops to the seacoast. During the latter part of March, Major Hills made a fourteen-days' horseback trip over the island, and personally superintended the organization and employment of men as well as giving practical lessons in road construction.

During the past month 195,000 pesos, from the customs receipts, have been spent in building and repairing roads in the island, and every cent of that sum has been well spent. Major Hills has certainly accomplished a great work that will be appreciated by the future as well as the present generation.



Echo Lake and West Milford road, Passaic County, northerly portion, during improvement.



Echo Lake and West Milford road, Passaic County, northerly portion, after improvement.

The Improvement of Our Roads.

SHOULD OUR RURAL COUNTIES IMPROVE THEIR ROADS UNDER THE STATE AID LAW?

By Oscar M. Voorhees.

THE REASON FOR ROADS.

In all civilized countries public roads have been rightly deemed a necessity. Population must be distributed, and the people of different localities must have the privilege of traveling from place to place. To allow this, roads are absolutely necessary. As civilization has advanced more roads have been required, for a larger volume and variety of produce needed to be moved. The last century has seen, not only public roads, but also railroads penetrating the farthest recesses of our land. And though the railroads now carry the great bulk of our produce, the public road is not less, but more necessary. For swift and easy access to all parts of the land is demanded.

In accordance with this demand our State, like all the rest of the country, has come to be traversed by a net-work of roads. The limit of road laying in a county like ours (Hunterdon) has about been reached. Judging the future by the experience of recent years we can scarcely expect a decrease in the mileage of our roads, and if there is an increase it will be but slight. I doubt if it would be possible to abandon five miles of road in any county at this time, unless a more favorably located substitute were provided. The attempt would meet with such opposition that those who proposed it would be compelled to yield. Nor is it likely that our roads will be less frequently used. Travel may be diverted from one road to another, but its volume is bound to increase. People of this day own more and better vehicles than did our fathers. There is more of interest in the country to demand travel. Picnics and fairs, suppers and harvest homes, excursions and auctions will still attract their numbers. Our

light vehicles now in so constant use cannot stand the rough knocks that the heavy farm wagon of days gone by endured. Hence our roads must be made passable or what an outcry there will be! Our roads are here to stay. The beginning of the twenty-first century will see fully as many miles of them as are here now. Will that century find them in the same condition?

COST OF ROAD REPAIR.

No one doubts that the people believe in roads. Every spring they tax themselves to keep them in repair. According to the report of the Comptroller of the Treasury of the State, for the year ending October 31st, 1899, the latest report at hand, the amount expended for roads in Hunterdon county, outside of the cities and boroughs, was as follows:

| | |
|-------------------------------------|--------------------|
| Alexandria township..... | \$937 85 |
| Bethlehem township..... | 456 88 |
| Clinton township..... | 2,500 00 |
| Delaware township..... | 3,200 00 |
| East Amwell township..... | 500 00 |
| Franklin township..... | 1,893 98 |
| Holland township..... | 1,148 35 |
| Kingwood township..... | 2,200 00 |
| Lebanon township..... | 2,015 25 |
| Raritan, outside of Flemington..... | 3,258 36 |
| Readington township..... | 2,291 72 |
| Tewksbury township..... | 2,000 00 |
| West Amwell township..... | 1,300 00 |
| Total | <u>\$25,132 41</u> |

In addition to this the freeholders spent for bridges \$26,914.07, making a total for roads and bridges over \$51,500. It so happens that by adding the county tax for bridges to the township tax for roads we find that about one-fourth of all our taxes go toward keeping roads and bridges in repair. This may seem a large proportion of the tax, and yet who that uses the roads does not frequently wish that they were better, even at greater cost, and the road overseer is heard to exclaim, "What can I do with the small amount allowed to my district?" If your tax is at the rate of \$1.20 per \$100, and you are a farmer taxed for \$4,000, you pay about \$12 a year, \$1 per

month, for the use of the roads and bridges of the county, while all the public roads of the State are open to you if you wish to use them.

When looked at in this light it would seem that the taxpayer gets more for his money in the matter of roads than from any other object to which his tax is applied. The question respecting road improvement is, Will it be to our advantage to pay more, and as a result get better roads?

WHY OUR ROADS ARE BAD.

Something may be said in favor of our roads. They have made travel and business possible in the past, and the present highly developed state of our counties may be said to be, in a large measure, due to them. With the methods of repair that have been employed, they have been, in some places, considerably improved. When out of repair it is due, in a measure, to inefficient methods of working. But the overseers will tell you that this is unavoidable, because the appropriation for the district must keep the whole district in repair, and they cannot, therefore, expend as much labor on the bad places as should be done. This is in part true. But when it is asked, "If you had more money, would you keep your road in good condition all the year through?" the answer must be, "That is impossible. Bad roads in winter and early spring are unavoidable, and we must put up with them."

CAN THEY BE IMPROVED?

But must we "put up" with them? Is there no way of making roads that will not only stand the wear of travel, but also endure the effects of rain and cold in winter? We answer unhesitatingly that there is. The reason our roads get bad is that the surface is of such soft and yielding materials that when wet they yield to the weight of the loads that pass over them. Into the tracks thus formed water collects, and the next load makes the tracks deeper. If the rainy weather continues, muddy roads with holes full of water appear, especially on the level places. Our carriages become covered with mud and our loads draw heavily. If the surface is made of sufficiently hard material to turn the water and prevent ruts, and if this material

is placed upon a foundation that will not yield to the weight of loads or heave with the frost, a road good all the year through is the result. This is not theory, for hundreds of miles of such roads have been built, and use has demonstrated their permanence.

GOOD ROADS IN EUROPE.

In England, and on the continent of Europe, most of the roads are of this character. But those countries have reason to be in advance of us in this matter, for they had the opportunity to begin first. They had also a splendid example after which to copy, for the old Romans were great road builders, and many of their roads, still in excellent repair, are in use to this day. "Twenty-nine military roads centered at Rome and had, according to Antoninus, a total length of 53,964 Roman miles"—about 48,570 English miles.

With so many other things to do in this new country, it is little wonder that the matter of permanent road making should have been left for the new century. The century just closed has done enough to give the necessary experience and courage, and it only remains for us to take hold of the work with the determination to do whatever the comfort, convenience and happiness of our people may require.

WHERE NEW JERSEY STANDS.

In the matter of permanent road improvement, New Jersey has taken a leading part. Having, in what we may call the metropolitan regions—the sections within forty miles of New York and Philadelphia—many growing cities and towns, the conditions were such as to compel attention and demand a solution. After much discussion the present State aid law was finally enacted, and, with slight changes, has remained on the statute books for nearly ten years. In accordance with the provisions of this law, permanent roads have been constructed, or are under construction (November 1st, 1900), in the various counties of the State as follows:

| COUNTIES. | Miles completed. | Miles in process of construction. |
|------------------|---------------------|---|
| Atlantic | 33.12 | 19.02 |
| Burlington | 104.57 | 10.58 |
| Camden | 42.87 | 5.73 |
| Cape May ..... | ..... | 13.98 |
| Essex | 48.72 | 3.75 |
| Gloucester | 48.73 | 1.68 |
| Hudson | 2.44 | ..... |
| Mercer | 57.66 | 6.17 |
| Middlesex | 66.51 | 5.93 |
| Monmouth | 37.20 | 17.45 |
| Morris | 26.75 | 15.99 |
| Ocean ..... | ..... | 10.00 |
| Passaic | 26.03 | 7.07 |
| Salem | 7.29 | ..... |
| Somerset | 26.70 | 11.50 |
| Sussex ..... | ..... | .09 |
| Union | 3.43 | ..... |
| Warren | .09 | 4.00 |
| Total | 532.11 | 132.94 |

It will be noticed that Hudson and Union, two populous counties, are credited with but few miles of hard roads. But it must be borne in mind that these counties and Bergen, Essex, Morris and Passaic did much in the way of road improvement before the State aid law was passed. So the permanent public roads of the State are already greatly in excess of the totals of the above table.

When we add to the 665 miles of road now built or under construction, the fact that 491.73 miles have been petitioned for by the people of the various counties, it gives us the impression that the people are in earnest in this matter. And when we find that the counties that now possess the largest mileage of improved roads are asking for the largest additional construction, it looks very much as though they believed them good things, and were not afraid of the cost. It may be that those of our citizens who have been so outspoken in their opposition were not aware how greatly good roads are valued by those who have the privilege of enjoying them. We are convinced that they will forego their opposition when they understand that they are standing in their own light, and will be found earnest advocates of the good roads' cause.

It has been argued by many that, though other parts of the State are in a condition to enter upon the work of building stone roads,

our rural counties are not. "These counties have a large area, with a relatively small population," it is said. "They are away from the immediate influence of the large cities. There is small prospect of growth in population, and therefore they cannot hope to enjoy the luxuries that are perfectly feasible for counties more favorably located."

These arguments have a force which must not be overlooked. But we need to beware, lest in presenting arguments against improved roads we unduly magnify the isolation and poverty of our rural counties, and really give impressions concerning them that are not true. Hunterdon, for instance, is one of the larger counties, only exceeded in area by Burlington, Ocean, Sussex, Atlantic, Morris and Monmouth, in the order named. It thus occupies the seventh place in order of size. But that does not argue that she is necessarily one of the poorer counties, for poverty or riches are comparative. Taking into account the fact that our wealth is owned almost exclusively by permanent residents, and that there are practically no men of enormous wealth among our people, the showing is one of which we may well be proud. For in the matter of assessed valuation to inhabitants but four of the rural counties surpass us, and but six in the whole State. Taking the figures of last year, we find that our average valuation, per inhabitant, is \$516. The counties that show a larger average valuation are Monmouth, Essex, Somerset, Salem, Bergen and Cape May, in the order named. All the other counties show a smaller average of wealth, per inhabitant, than Hunterdon. Hence he who pleads poverty for his county does it in ignorance, and should endeavor to become better informed.

HOW ABOUT TAXATION?

So, too, in the matter of taxation, rural counties are especially favored. We hear complaints of high tax rates. But people who complain do not always stop to discriminate. The bulk of our taxes are self-imposed by the various townships for things they want and for which they agree to pay. The fact remains that in our rural counties the rate of taxation imposed by the counties is less than it is in counties containing large cities.

WHERE ARE OUR PERMANENT IMPROVEMENTS?

A study of the items of county expenditures as they appear in the reports of the Comptroller of the Treasury will reveal the fact that, with the exception of bridges, none of these expenditures represent anything lasting. They may all be classed under the head of "government" or "administration." At the end of any year there is nothing of a permanent nature to carry over to the years to follow. The county has nothing but bridges to show for the outlay. Would it not seem wise to add each year a few miles of permanently built road? and thus say to generations to come: "This have we contributed as of value throughout all the years to come. We were not content to spend our all upon ourselves, but we have made some sacrifices that those who shall come after us may be blessed."

HOW ABOUT REPAIRS?

"But," it will be remarked, "do not such roads get out of repair and are they not then harder on horse and wagon and traveler than dirt roads?" Of course all good things that are used will show wear, and a stone road will be used far more than it was before it was improved. People will go out of their way in order to enjoy the comfort of it. This is especially the case in winter, when parallel roads are covered with mud. Then, too, the strain is the greatest, for the sharpened caulks of the horses' shoes tear up the surface more than at other times; and on hills, especially where heavy loads are drawn, this will be particularly noticeable. But, after all is said, the road is far better than any dirt road could possibly be under the same usage. The foundation is as strong as ever; only a little of the surface is worn away, and perhaps here and there a few loose stones appear.

ANNUAL REPAIRS THE BEST.

If this heavy wear is allowed to continue several years, the road will begin to be somewhat rough, and of course travel over it will not be quite so pleasant. The cost of repair will then seem quite an

item. But we do not let our ordinary roads go without repairs, much less should we withhold care from them after they are improved. The law provides that the contractor shall keep the road in repair one year after its completion, and a percentage of the cost is withheld to insure compliance with this provision. The first winter will very likely show the weak places, if any should appear, and the hollows that form must be filled and the surface put in good condition before the road is finally accepted. To secure the best results a light dressing of sand or finely broken stone should be applied each spring, all loosened stones being first removed. This covering will wear down in a few weeks, leaving the surface as smooth and pleasant to ride over as before. The cost of this should not be greater than the cost of "working" an ordinary road, and when you are doing it you are not putting soil on the surface to make mud when it rains and dust when it is dry. If you take pains with your handsome new carriage, keeping it free from dust and mud, and thus show that you have some pride in it, of course you will advocate making some effort to keep your valuable new road in good repair. It is worth the effort. It doesn't matter much about the old carriage and the old road. Dust and mud are good enough for them. But they do not minister greatly to one's pride and satisfaction.

COMFORT FOR PEDESTRIANS.

One thing more may be said for our new road. It forms an excellent pathway for pedestrians, both in winter and in summer. There are few good side-paths in the country, and much of the time the road is either too muddy or too dusty to allow comfortable walking. But you can always walk with comfort on a stone road unless, perhaps, when the snow has fallen. Then people do not care to walk anywhere, but delight to fly along to the music of silvery bells.

SOMETHING ABOUT COST.

Let us now study the question of the cost of stone roads, and the effect of their construction upon the tax rate. Everything of value costs; and that which costs the least at the first, is not necessarily

cheapest. The man who buys a machine too light for the work it is expected to do because it is cheap, is very likely to find that the cost of repairs and the loss of time resulting therefrom soon eat up the amount saved in the beginning.

BAD ROADS A CONSTANT TAX.

This is true in the laying out of a road. The surveyors of the highways who would lay a road over steep hills and across low, swampy places, rather than one having an easier grade and a solid roadbed, because the right-of-way for the first route could be secured more cheaply, would necessitate a higher tax rate to keep the road in repair, and in addition compel travelers to pay constant toll. For every time we find it necessary to climb or descend a hill that might have been avoided, an unnecessary tax is placed upon our team; and the sum of these unnecessary taxes upon the countless travelers of a century is the premium the century pays as a result of the short sightedness of those who laid the road in a poor place to avoid cost. Many of our roads are badly laid. In most cases it is too late to change the location. All we can do now is to make them as good as they ought to be, considering the amount of travel that passes over them. There are some roads—many miles, indeed, in the county—that would not pay the cost of improvement, because so infrequently used. There are other roads that, being much traveled, we cannot afford to leave unimproved. The inconvenience and annoyance of their badness is a constant tax upon their many users which should not be endured any longer than is absolutely necessary

HOW STONE ROADS ARE PAID FOR.

The State aid law provides that when a road is improved it becomes thereafter a State road, and is to be kept in repair by the county. The expense of such improvement is divided into three parts. One part, ten per cent., is apportioned by a commission among the owners of property along the road according to the advantage the road is likely to be to them. In very few communities would a farmer be assessed more than \$50, I am told, unless he was a

very large landowner. A second part, thirty-three and one-third per cent., is paid by the State, and the remainder, fifty-six and two-thirds per cent., is paid by the county. This is the portion of cost that becomes a direct tax upon all taxable property of the county.

AVERAGE COST OF ROADS.

As a portion of the expense is paid by the State it becomes important that the cost should be carefully reckoned. Hence it is known what every strip of road improved under the State aid law has cost. Anyone desirous of exact knowledge in the matter will find it in the reports of the Commissioner of Public Roads. A cursory examination has led to the conclusion that the average cost per mile of stone roads is between \$5,000 and \$5,500. The average for all roads built is much less than this, viz., slightly more than \$3,750. But as some of these were of gravel or oyster shells, we must put the cost of stone roads higher. If we say it would cost an average of \$5,350 per mile to build our roads, the county's share would be just \$3,000 per mile, and the \$20,000 appropriated by Hunterdon county a few months ago would have built between six and seven miles of road.

EFFECT THIS WOULD HAVE ON TAX RATE.

The law limits the expenditure in any one year to an amount that would be one-fourth of one per cent. (.25 on \$100) of the ratables. But few, if any, counties have expended up to the limit. In Somerset county, where for the last four or five years they have built from four to seven miles of road, the tax rate has been increased but little over one-tenth of one per cent., that is .10 on \$100. If, for example, \$20,000 had been expended this year, as at first contemplated in Hunterdon county, and there had been no reduction in other expenditures, the tax rate would have been increased .113 on each \$100. Our county rate last year was .54. It would consequently have been .653 per \$100. Taking again our man, whose assessed valuation is \$4,000, the building of nearly seven miles of permanent road would have increased his tax just about \$4.52; and that \$4.52 would have represented a permanent improvement, one that would be in service

several centuries hence. Can you think of any investment in our county that in real comfort and convenience to humanity would yield better results? If the township rate for roads is now .20, as it is in one township I know of, the man assessed for \$4,000 has paid each year toward their repair \$8.00, and they are little better than they were when he was a boy. It seems incredible that we should be willing to go on spending our money in this way when we know that there is really no improvement. Surely there ought to be manifested in this matter some sign of true progressiveness when so much is shown in other directions.

SCHOOL TAXES TO BE REDUCED.

There is, however, one circumstance that is to work strongly in our favor. The State has reduced the tax for public schools by appropriating toward their maintenance, out of the general treasury, something over three quarters of a million dollars, or, to be exact, \$813,750. This amount has been distributed as follows:

| | |
|------------------|-------------|
| Atlantic | \$21,058 41 |
| Bergen | 37,863 10 |
| Burlington | 20,136 30 |
| Camden | 34,517 91 |
| Cape May | 6,310 85 |
| Cumberland | 15,360 19 |
| Essex | 189,358 33 |
| Gloucester | 12,968 75 |
| Hudson | 151,925 66 |
| Hunterdon | 15,985 22 |
| Mercer | 41,081 25 |
| Middlesex | 25,427 57 |
| Monmouth | 43,802 10 |
| Morris | 24,964 52 |
| Ocean | 7,819 68 |
| Passaic | 59,156 04 |
| Salem | 12,545 34 |
| Somerset | 16,814 22 |
| Sussex | 10,410 91 |
| Union | 37,054 13 |
| Warren | 16,227 77 |

It will be observed that Hunterdon county received \$15,985.22. As a result our tax for school purposes will be reduced 10 cents on each \$100 of valuation. If we had devoted this \$16,000 to road improvement we could have built about five and one-half miles of

stone road, and our tax bills would not have been increased one cent. As there is the probability that this appropriation will be continued, the way is clear to do something in the matter of stone road building free of real cost to ourselves. If we put the money in our pockets, we indicate that we are lacking in true zeal for the public welfare.

HOW ABOUT PETITIONS FOR IMPROVEMENTS?

It may be said that there will be an unwillingness to petition for roads on account of the 10 per cent. assessment. This has not proved the case in other counties except at the beginning. When the real convenience of improved roads is understood the people will be urgent in their demand for them, and the question will not be, "Where shall we find a place for our money?" but "How shall we decide between the claims of the different sections?" Our people know a good thing when they see it, and it doesn't take a prophet to tell that they will surely know a good road and want it.

PAY-AS-YOU-GO PLAN FAVORED.

It has been assumed in these articles that if the county of Hunterdon should begin the work of road improvement it would be content with building a short section each year, and continue the work year by year in accordance with a well matured plan. The writer is not unaware that another method has been advocated—that of borrowing money and building as large a mileage as our portion of the State appropriation will allow. The latter plan has been followed by Morris county, the former by Somerset county, and those who have the opportunity of visiting these neighboring counties will find reasons of their own for approving one or the other of these methods. We propose to give our reasons for advocating the pay-as-you-go method.

REASONS FOR THIS PLAN.

1. We do not like a county debt. We are well aware that corporate debts are sometimes an advantage. But this is especially true in rapidly growing communities where the increase in taxable property,

resulting from the improvement, makes deferred payments safe and easy. In Union county, for instance, the roads connecting the principal cities were macadamized before the State aid law was passed, the county issuing bonds for the greater part of the cost. As a result of this, and other improvements, the taxable property has increased so materially that the tax collected on this increase has more than paid the interest on the bonds. But Hunterdon, being a rural county, we cannot expect such an increase. Hence there would be a constant drain for interest, as well as for a sinking fund to meet the bonds when they should mature.

ANOTHER REASON.

2. A second reason is that undue haste might lead to reckless expenditure. Our county officials are entirely lacking in experience in road building, and hence errors in judgment are possible. It is better to build a short stretch of road, and from the experience thus gained as a basis, better results, if possible, might be secured.

STILL ANOTHER.

3. A gradual process would result in a better system. It would give time for the study of the needs of the various localities. The plan of the State officials is, so far as possible, to build roads that connect important towns, and which, when extended, form a system by which the various parts of the State are joined together. Roads should be constructed where they will do the greatest good to the greatest number. This would more likely be accomplished if time were taken to study the needs of the various localities than if each petition were granted in the order in which it was presented. This method would also be in accordance with a conclusion already arrived at, that the development of a system of improved roads requires time. If the end sought can be secured by the slower method of paying for the roads as they are built, I feel sure there will be greater satisfaction all around.

IS NOT THIS TOO SLOW?

I am well aware that many will say such a method is too slow, and that to build only from five to seven miles a year would be but going at a tortoise pace. But it will be just that much faster than we have been going the last century, and if it were continued for twenty-five or thirty years it would link practically all the villages of our county, and nearly every section would be within three or four miles of a stone road.

THE UNEQUAL TAXATION QUESTION.

Let it be supposed, for the time being, that road improvement is determined upon and a beginning made. May it not be claimed that many will be required to pay taxes for which they received no benefit? If a road is built in a northern township, what advantage will that be to the people of the southern townships. Or if the first road is built in the eastern part, may not the people of the west complain? This is a matter that must be considered, and in coming to a conclusion we must beware lest we are actuated by narrow and selfish motives.

HOW ABOUT SCHOOL TAXES?

We must remember that the benefits of taxation cannot be equally distributed, nor can each taxpayer claim a direct return for the amount he contributes to the public funds. Many of our people, who have no children of school age, pay large amounts to the school fund, while men of smaller means, but with several growing children, have them educated at a very trifling cost, if we consider only the portion of the school tax they actually pay.

AND THE COURTS.

So in the matter of the courts. The writer, though taxed for the support of the courts, has never been within a court-room as a litigant, nor has his father before him, as far as he knows. But many a man

who has scarcely paid a dollar of tax has found the protection of the courts effective if falsely charged with crime, or learned the quality of justice meted out if guilty .

AND THE ROADS.

So, too, in the matter of roads and bridges. We are all taxed to keep them in repair. But some heavy taxpayers scarcely use them, while the huckster or rag picker, from far away, who, perhaps, never saw a tax notice, use them continually. Last year a new iron bridge was built in the eastern part of the county, at a cost of \$5,000—nearly one-fifth of the entire expenditure by the county that year for bridges. But I presume that three-fourths of our people never heard of that bridge, or at least never drove over it. And yet we were all taxed to meet the cost.

MANY BENEFITS ARE INDIRECT.

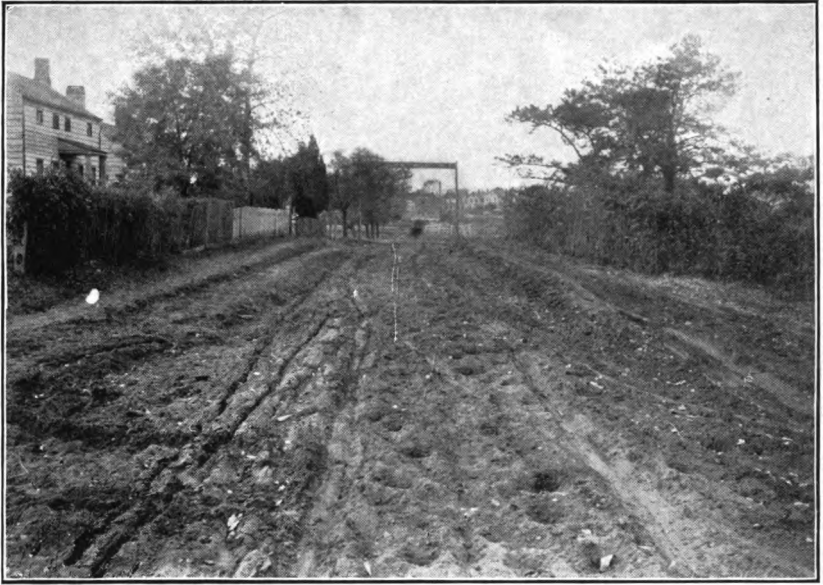
The conclusion that must be drawn from all this is plain. We can never claim that we get back just what we pay for when we pay our taxes. But we are not therefore to complain of inequality and begin pulling to pieces the fabric of our government. The man who helps support schools, though none of his immediate family attend them, is paying for education in general, and the return he gets is in the satisfaction experienced in living in a community where education is within the possibility of all. So the individual may never get from the courts a dollar of return in actual litigation, but he does get the satisfaction of living in a community where law is generally respected. I may not use the roads and bridges of the county, though I pay to keep them in repair. But I receive my supplies over them, they are used by my friends when they visit me. They make travel from place to place easy, and thus help us to enjoy our civilization. I get my pay in the satisfaction I feel in living in a civilized community. No one can say I do not get any benefit from these things for which I pay, but of which I do not make direct use. The benefit is indirect, that is all. The man who looks for a direct benefit for every dollar he expends or pays in the way of taxation, will find himself in a perpetual quarrel with society, and hence will be of all men most miserable.

MUCH INDIRECT BENEFIT FROM GOOD ROADS.

If by this long diversion I have established my point, the space will not be consumed in vain. For when we come back to the question of road building we shall find that, while all of us cannot possibly be benefited equally or proportionately by the first few miles that are built, we shall all be benefited indirectly. We shall have the satisfaction of having helped on a good cause—one that means better things for a whole century at least. When we are wearily plodding through the mud some blustery March day, we can know that over in an adjoining township our friends are jogging along at a good pace over hard, smooth roads. And we shall know that in due time that hard, smooth road will reach our part of the county. For just as soon as we see what a macadam road means in the way of comfort all the year through, we are going to ask to have it extended in our direction.

NOT ALL INDIRECT, HOWEVER.

We are not to think that the benefit will all be of an indirect sort. There will be direct advantages to the various communities as the roads are extended to them. It will be easier for many people to get to the store, post office, school and church. People from long distances away will use the new road occasionally, and will be glad to see the improvements. It will soon be discovered that a location on or near a stone road is a valuable asset, especially if the land comes into the market, for buyers will think of these things and pay for them too. It would be unwise to expect a rapid advance in valuations, or a large influx of city people, for we in Hunterdon county are too far from the great cities to suit commuters, and there are places that offer larger attractions—higher mountains and beautiful lakes—to which the summer visitor will feel attracted. But such advantages as we have will be recognized and enjoyed, and we shall all be glad for the benefits received.



Key Port and Keansburgh road, Monmouth County, before stoning.



Key Port and Keansburgh stone road, Monmouth County.

FOR WHOM SHOULD WE BUILD ROADS?

But someone will say, what then are we to build roads for if it is not to bring our property into the market, and secure for it higher prices from people from the city? And I reply, we should build good roads for ourselves and our children, for our own pleasure and comfort and convenience. We do not want to get our people out of the county but to keep them here. The county should be such a pleasant place to live in that our old and honored families will want to remain. We have a population that in character and attainments compares favorably with that of any other population in the State, and in the whole country for that matter. And our progressive families should be encouraged to stay. If we continually overlook our advantages and opportunities, we shall find desirable neighbors going elsewhere. But if we extend our efforts in every practicable direction to make our county a pleasant and profitable place to live in, our people will remain, and we will be spared that large exodus of old families and influx of foreigners that has made many parts of our country, New England especially, decadent. If we build roads, let us build them for ourselves and for our descendants—for our own pleasure, enjoyment and profit. They will help make life in our rural communities livable. They will help us develop our social virtues. They will help make us good citizens if we will only let them. Our country people are good enough to want and to secure the best, and the State stands ready to aid us with a liberal hand if we will only do our part.

We give space to the following article on account of some novel ideas in road building therein expressed:

THE DESIGN OF ECONOMIC STREETS AND PAVEMENTS.

By Halbert Powers Gillette.

There seems to be a well settled conviction among engineers that by survival of the fittest, a certain class of pavements has become standard, and that but little remains for the engineer to do but to select the particular standard design best fitting the traffic and the purse of the taxpayer. In other words, the design of the pavement

no longer seems to require inventive ability on the part of the engineer. I am, however, convinced that there is still much which requires inventive genius in the truly economic design of so apparently simple a structure as a street or road.

The three functions of a pavement, in the order of their importance, are: (1) To distribute the concentrated wheel-load over a sufficient area of subsoil; (2) to act as a roof, keeping the subsoil dry; (3) to furnish a smooth surface, reducing the rolling friction.

Wet, clayey soil has a much less supporting power per square inch than dry, which makes the second function, above given, of great importance. Of wet sand the same cannot be said, for were it possible to keep a sandy subsoil merely damp it would support a greater load and therefore be preferable to dry.

Whether the soil be clay or sand, however, it is absolutely necessary to provide a pavement of sufficient thickness to reduce the concentrated wheel-load to such a pressure per square inch that the soil will sustain it without appreciable settlement. The necessary thickness obviously varies with the character of the soil and its degree of moisture.

Where a mass of loose fragments, such as broken stone, is spread upon a soil, it is evident, theoretically, that the smaller the fragments the greater will be the area of subsoil over which a concentrated wheel-load will be distributed. Experiment confirms this conclusion. Therefore, where a macadam road is built over sand, the smaller the stone in the lower course of macadam the better, for less stone will be forced down into subgrade by the steam roller. It is during construction that much may be saved by bearing the above stated fact in mind.

If, as we have seen, the prime function of a pavement is to distribute pressure, the question very naturally arises whether it may not be well to use as cheap a foundation material as possible to accomplish this purpose, and reserve the more expensive material to form a thin wearing coat that will also serve to shed water. This is, in fact, now done, but not to the extent that it should be; for we find many cities invariably using six to eight inches of concrete for foundations, where a layer of broken stone, slag, cinders or gravel would form a much cheaper and better foundation. If found desirable, such a foundation might be covered with two to four inches of concrete.

Whenever a granular mass is used for the foundation of a pave-

ment, it is desirable to *have all the voids filled, in order to entirely prevent movement of the fragments under the jarring of passing loads*. If the fragments are angular and well compacted, there is less need of filling the voids, but if the fragments are round it is imperative.

Sand alone has often been used as a foundation for brick and other pavements, but frequently with very unsatisfactory results on account of uneven settlement. *Sand can, however, be made quite as unyielding as gravel simply by filling the voids with fine dust*. For this purpose it would be well if cities, especially those in the middle west, would secure pulverizing mills and grind about one-third of the sand used to powder, then mix with the coarser sand and puddle well in forming a foundation. No rolling is necessary. Water, if supplied in abundance, will puddle sand that contains sufficient fine dust, until it is almost as hard and unyielding as concrete. Engineers who have seen the adamant consistency of quicksand after it has dried out will bear witness to the statement just made. It is evident that on a sand subsoil, if fine dust be spread and washed in, the supporting power of the soil will be so greatly improved that a very thin foundation will suffice.

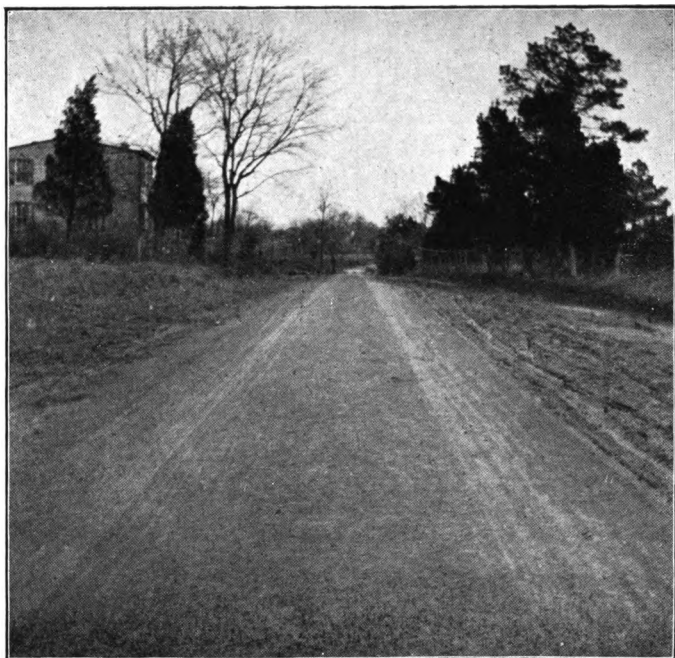
In discussing economic pavement design, we have thus far dwelt upon the foundation and subsoil; we may now consider briefly the wearing coat. Wood and stone-block pavements are gradually but surely falling behind in the race for supremacy; wood, because it is, in the long run, not so cheap as brick; stone, because it is more expensive than asphalt, and scarcely more durable where the traffic is great. The noise caused by a stone-block pavement is alone a good enough reason for its rejection, even where the cost of maintenance is less than asphalt.

Vitrified brick, if laid flatwise, is almost as cheap in first cost as cedar-block, and when this is realized, I look to see such cities as Detroit entirely discontinue the building of wooden pavements. Brick are as yet always laid edgewise in street paving, thus giving a wearing coat four inches thick. Since it is the function of the foundation to distribute the load, a thickness of four inches in the wearing coat is not required unless for some other reason. When a brick pavement has worn down about three-fourths of an inch on an average, there are so many spots where the wear has been three times greater, that an entire renewal becomes necessary; for this reason three inches seems

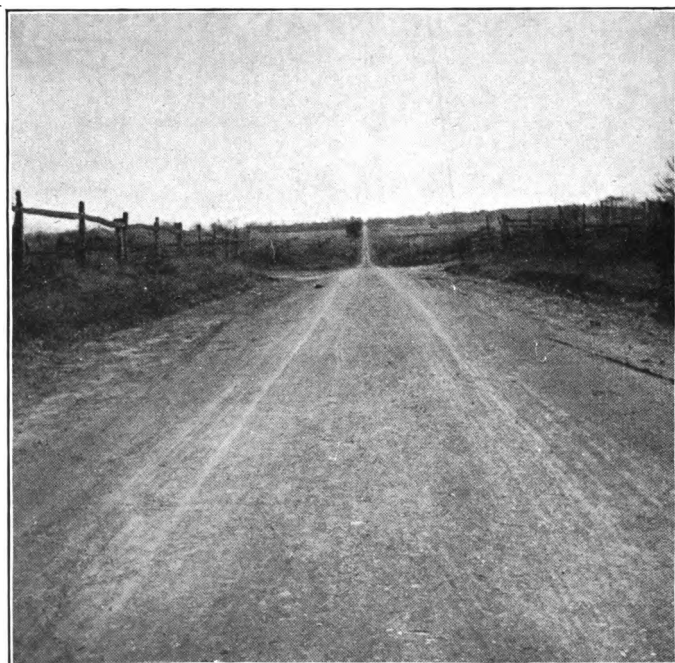
to be the maximum thickness necessary in brick pavements, while, if the traffic is so light that wear is inappreciable, as upon most residential streets, two and one-fourth inches is an ample thickness, and this may be secured by laying the ordinary "pavers" flatwise. It may be argued that when so laid the brick will crack or tilt up under a heavy load. That they neither crack nor tilt is proven by an examination of brick sidewalks across which heavy loads have passed over flat bricks; and it may also be observed that in spots where bricks have been worn until only one and one-half inches thick, the brick remains uncracked.

Granite and other stones wear round by the chipping off of corners, and in comparatively few years a stone pavement becomes so rough and slippery that it must be renewed. Brick wears far more slowly than macadam, but when worn only a fraction of its thickness, the entire surface coat has to be renewed on account of its very uneven wear. Macadam, on the contrary, needs only to be picked up and re-rolled to put it in as good condition as new, except, of course, for the material lost by wear. Asphalt wears more slowly than brick, but it rots out in fifteen to twenty years, so that where the wear of traffic is slight, brick should always be selected if economy alone governs. Tar macadam will be found subject to the same deterioration by rotting as asphalt. I would therefore suggest that where such pavements are built the whole thickness should not be bound with tar or asphalt, but only the top two inches—a thickness that will wear out before it rots out.

While upon the subject of durability, a few words as to the maintenance of macadam may not be out of place, for cost of maintenance is the ground upon which it is frequently rejected. Macadam ravel in dry weather, but it is a mistake to suppose that, therefore, it requires constant sprinkling. Over some of the recently built New York State roads a sprinkler passes several times daily, doing little good at great expense. What a macadam road does require is an occasional drenching when and where it begins to show signs of ravelling, which is accomplished by going over a short section time and again with a sprinkler during the night; for if the sun is up the water has not time to soak in before it is evaporated. Done as suggested, the cost of maintenance is greatly reduced. A thin coat of sand over the surface will further reduce the rapidity of evaporation.



Ashland road from Ebert's Bridge to Ashland, Camden County. Ten-inch Telford.



Ashland road from Hurff to end of wood, Camden County. Ten-inch Telford.

PAVEMENTS AND HEAT.

Tests made in Boston prove that wood pavements radiate more heat than any other kind. The time of the experiment was early afternoon, with the thermometer at 98 in the shade. The average temperature was $124\frac{1}{2}$ for the wood pavement, 115 for granite blocks, 113 for asphalt and $102\frac{1}{2}$ for macadam.

QUARRIES IN NEW JERSEY PRODUCING ROAD METAL.

BERGEN COUNTY.

| Location of Quarry. | Owners. | P. O. Address. |
|---------------------|-----------------------------|--------------------------|
| Edgewater..... | Cody Bros..... | Edgewater, N. J. |
| Linwood..... | Carpenter Bros..... | Linwood, N. J. |
| Shady Side..... | Brown & Fleming..... | Englewood, N. J. |
| Fairview..... | Fairview Stone Crushing Co. | 1996 Chambers St., N. Y. |

ESSEX COUNTY.

| | | |
|------------------|----------------------------|--------------------------|
| Montclair..... | Osborne & Marcellis..... | Upper Montclair, N. J. |
| Montclair..... | F. J. Marley..... | *... Little Falls, N. J. |
| Orange..... | Geo. Spottswood & Co..... | Orange, N. J. |
| Millburn..... | G. A. Lighthipe & Son..... | Millburn, N. J. |
| Cedar Grove..... | F. J. Marley..... | Little Falls, N. J. |
| Montclair..... | Francisco Bros..... | Orange, N. J. |
| Short Hills..... | Stewart Hartshorn..... | Orange, N. J. |
| Caldwell..... | P. A. Matthews..... | Caldwell, N. J. |

HUDSON COUNTY.

| | | |
|------------------|---|---------------------|
| Bergen Hill..... | B. M. & J. F. Shanley..... | Newark, N. J. |
| Palisades..... | Palisade Construction Co., | |
| | No. 1 Montgomery St., Jersey City, N. J. | |
| Palisades..... | Hudson County Contracting Co., | |
| | No. 367 Communipaw Ave., Jersey City, N. J. | |
| Guttenberg..... | Meeks..... | Guttenberg, N. J. |
| Granton..... | Wagner & Duff..... | Granton, N. J. |
| Granton..... | F. J. Marley..... | Little Falls, N. J. |
| Woodcliff..... | John S. Lane & Sons..... | Guttenberg, N. J. |
| Shady Side..... | Bull's Ferry Land Co..... | Guttenberg, N. J. |

HUNTERDON COUNTY.

| | | |
|--------------------|--|-------------------------------|
| Byram Station..... | B. M. & J. F. Shanley..... | Newark, N. J. |
| Byram Station..... | Trenton Stone and Construction Co..... | Trenton, N. J. |
| Lambertville..... | W. N. Ireland, Agent..... | 1241 Filbert St., Phila., Pa. |
| Middle Valley..... | Middle Valley Trap Rock Co..... | Middle Valley, N. J. |

MERCER COUNTY.

| | | |
|-----------------|---|---------------------|
| Moores..... | Delaware River Quarry and Construction Co., | Lambertville, N. J. |
| Goat Hill..... | B. M. & J. F. Shanley..... | Jersey City, N. J. |
| Hopewell..... | Hopewell Quarry Co..... | Hopewell, N. J. |
| Titusville..... | Trenton Stone and Construction Co..... | Trenton, N. J. |
| Belmont..... | Mercer County Workhouse..... | Trenton, N. J. |

MORRIS COUNTY.

Nearly all road-building material in this county is of native rock, gneiss, granite and shale. The traps are mostly imported from other counties.

| | | |
|--------------------|-------------------------------------|----------------------|
| Millington..... | Morris County Crushed Stone Co..... | Morristown, N. J. |
| Mountain View..... | Standard Paving Co..... | Mountain View, N. J. |

PASSAIC COUNTY.

| | | |
|---------------------|----------------------------------|---------------------|
| Garret Mountain.... | Francisco Bros..... | Little Falls, N. J. |
| Paterson..... | F. J. Marley..... | Little Falls, N. J. |
| Paterson..... | Paterson Crushed Stone Co..... | Paterson, N. J. |
| Paterson..... | New Jersey Stone Co..... | Rutherford, N. J. |
| Paterson..... | McKiernan & Bergen..... | Paterson, N. J. |
| Notch Road..... | F. J. Marley..... | Little Falls, N. J. |
| Notch Road..... | Dowling Construction Co..... | Paterson, N. J. |
| Haledon..... | R. M. Torbet..... | Haledon, N. J. |
| Hawthorne..... | Daniel & D. Stanley..... | Hawthorne, N. J. |
| Preakness..... | Colfax & Steele..... | Pompton, N. J. |
| Great Notch..... | Wright & Lindsley..... | Orange, N. J. |
| Paterson..... | Preakness Stone Crushing Co..... | Paterson, N. J. |

SOMERSET COUNTY.

| | | |
|-----------------------|-----------------------------------|----------------------|
| Dunellen..... | Garrison & Gray..... | Dunellen, N. J. |
| North Plainfield..... | A. I. & N. B. Smalley..... | Plainfield, N. J. |
| Bernardsville..... | Somerset Stone Crushing Co..... | Bernardsville, N. J. |
| Mine Brook..... | James Freeman..... | Mine Brook, N. J. |
| Plainfield..... | J. Y. Wilson & Co..... | Plainfield, N. J. |
| Millington..... | Millington Stone Co..... | Millington, N. J. |
| Chimney Rock..... | Bound Brook Crushed Stone Co..... | Bound Brook, N. J. |
| Somerville..... | William Hardgrove..... | Somerville, N. J. |
| Rocky Hill..... | Rocky Hill Stone Storage Co..... | Rocky Hill, N. J. |
| Bernardsville..... | Frank S. Tainter..... | Morristown, N. J. |
| Far Hills..... | Grant Schley..... | Far Hills, N. J. |
| Bernardsville..... | Mine Brook Stone Co..... | Bernardsville, N. J. |

SUSSEX COUNTY.

| | | |
|-------------|--------------------------|---------------|
| Newton..... | Newton State Quarry..... | Newton, N. J. |
|-------------|--------------------------|---------------|

UNION COUNTY.

| | | |
|--------------------|---------------------------|----------------------|
| Scotch Plains..... | Hetfield & Weldon..... | Scotch Plains, N. J. |
| Murray Hill..... | Commonwealth Company..... | Murray Hill, N. J. |
| Summit..... | A. A. Potter..... | Summit, N. J. |
| West Summit..... | Victor G. Smythe..... | West Summit, N. J. |
| Springfield..... | Stewart Hartshorn..... | Springfield, N. J. |

GRAVEL PITS IN NEW JERSEY USED FOR ROAD BUILDING.

ATLANTIC COUNTY.

| Location of Pits. | Owners. | P. O. Address. |
|--------------------|--|----------------------|
| Mays Landing..... | Estate of Wm. Post..... | Mays Landing, N. J. |
| Mays Landing..... | D. E. Izard..... | Mays Landing, N. J. |
| Estelville..... | A. E. Bourgeois..... | Estelville, N. J. |
| Tuckahoe..... | Henry D. and Wm. G. Moore, Haddonfield, and 931 Chestnut St., Phila., Pa. | |
| Mays Landing..... | J. E. P. Abbott..... | Mays Landing, N. J. |
| Mays Landing..... | Samuel Champion..... | Mays Landing, N. J. |
| Pleasantville..... | West Jersey and Seashore Railroad..... | Camden, N. J. |
| Pleasantville..... | P. & A. C. Railroad..... | Pleasantville, N. J. |

BURLINGTON COUNTY.

| | | |
|------------------|----------------------------------|--------------------|
| Riverton..... | Lewis Connor..... | Riverton, N. J. |
| Westfield..... | Enoch Evans..... | Westfield, N. J. |
| Westfield..... | Estate of Wm. R. Lippincott..... | Westfield, N. J. |
| Palmyra..... | Isaac Evaul..... | Palmyra, N. J. |
| Palmyra..... | Wm. F. Morgan..... | Palmyra, N. J. |
| Burlington..... | Frank Warren..... | Burlington, N. J. |
| Burlington..... | James Malsed..... | Burlington, N. J. |
| Riverton..... | Franklin T. Hunter..... | Riverton, N. J. |
| Bridgeboro..... | Edwin M. Brock..... | Bridgeboro, N. J. |
| Moorestown..... | Michael Flynn..... | Moorestown, N. J. |
| Hartford..... | John Warrick..... | Hartford, N. J. |
| Rancocas..... | James W. Stokes..... | Rancocas, N. J. |
| Columbus..... | Thomas A. Bunting..... | Columbus, N. J. |
| Columbus..... | Thomas H. Rogers..... | Columbus, N. J. |
| Kinkora..... | C. G. Kinsley..... | Kinkora, N. J. |
| Columbus..... | Edward Wilson..... | Columbus, N. J. |
| Columbus..... | Charles Sharp..... | Columbus, N. J. |
| Florence..... | George Bowne..... | Florence, N. J. |
| Georgetown..... | John B. Hutchinson..... | Georgetown, N. J. |
| Jobstown..... | Charles Black..... | Jobstown, N. J. |
| Centerton..... | Allen Austin..... | Centerton, N. J. |
| Willingboro..... | Mrs. John Buzby..... | Willingboro, N. J. |
| Beverly..... | J. H. Coomb..... | Beverly, N. J. |
| Burlington..... | Samuel Johnson..... | Burlington, N. J. |
| Beverly..... | William Baggs..... | Beverly, N. J. |
| Beverly..... | Joshua Fenimore..... | Beverly, N. J. |
| Moorestown..... | Samuel C. Decou..... | Moorestown, N. J. |

CAPE MAY COUNTY.

| | | |
|------------------|--|---------------|
| Belle Plain..... | West Jersey and Seashore Railroad..... | Camden, N. J. |
|------------------|--|---------------|

CUMBERLAND COUNTY.

| | | |
|----------------|------------------|------------------|
| Millville..... | John Golder..... | Millville, N. J. |
|----------------|------------------|------------------|

MIDDLESEX COUNTY.

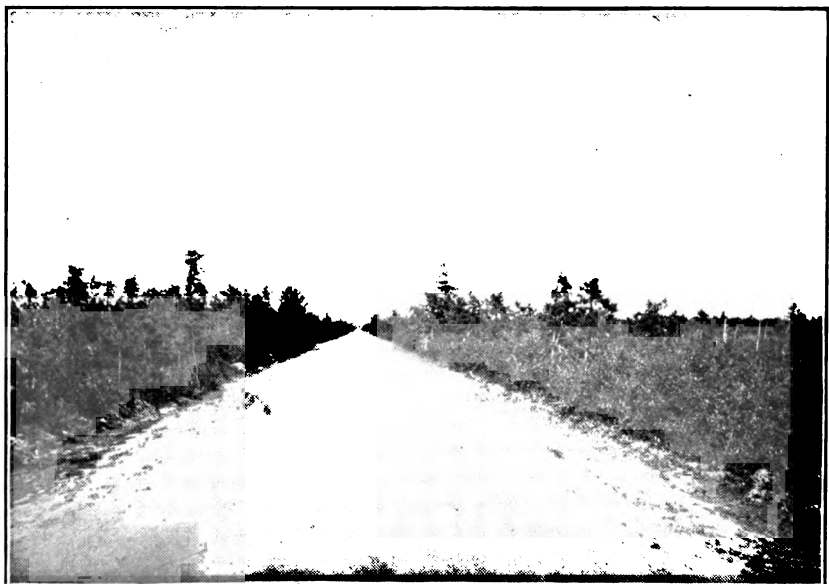
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| Old Bridge..... | I. Biddle Herbert..... | Old Bridge, N. J. |
| Helmetta..... | Geo. W. Helme..... | Helmetta, N. J. |
| Jamesburg..... | James Buckelew's Sons..... | Jamesburg, N. J. |
| Englishtown..... | Charles Hoffman..... | Englishtown, N. J. |

MONMOUTH COUNTY.

| | | |
|-------------------|--------------------------|---------------------------|
| Hopping..... | D. G. Campbell..... | Middletown, N. J. |
| Navesink..... | D. R. G. Andrews..... | Navesink, N. J. |
| Hopping..... | Peter L. Conover..... | Atlantic Highlands, N. J. |
| Leonardville..... | John T. Hopping..... | Leonardville, N. J. |
| Red Bank..... | Mrs. Henry Field..... | Red Bank, N. J. |
| Red Bank..... | James Hubbard..... | Red Bank, N. J. |
| Red Bank..... | John L. Applegate..... | Red Bank, N. J. |
| Chapel Hill..... | Geo. T. Hopping..... | Chapel Hill, N. J. |
| Middletown..... | J. D. Conover..... | Middletown, N. J. |
| Farmingdale..... | Manasquan Gravel Co..... | Asbury Park, N. J. |
| Allenwood..... | Manasquan Gravel Co..... | Asbury Park, N. J. |
| Shark River..... | Manasquan Gravel Co..... | Asbury Park, N. J. |
| Navesink..... | Webster Swan..... | Navesink, N. J. |
| Holmdel..... | William Crawford..... | Holmdel, N. J. |
| Keyport..... | Keyport Gravel Co..... | Keyport, N. J. |
| Red Bank.... | Red Bank Gravel Co..... | Red Bank, N. J. |



Egg Harbor and Greenbank, Atlantic County. Buffalo avenue before improvement.



Egg Harbor and Greenbank, Atlantic County. Buffalo avenue after improvement.

Statements by Engineers and Supervisors.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Egg Harbor and Green Bank road, township of Mullica and city of Egg Harbor, county of Atlantic, State of New Jersey. Total length, 37,112.2 feet, Total length, 7.03 miles.

Width of gravel-bed, 14 feet.

Length of gravel-bed, 37,112.2 feet.

Depth of gravel-bed, 6 inches on sides, 8 inches in center.

| | |
|--|--------------------|
| Total cost of gravel purchased in the bank..... | \$909 21 |
| Preparation of road-bed (cost)..... | 2,489 81 |
| Compact gravel, 11,225.32 cubic yards, in place, at 27 cents; total... | 3,030 83 |
| Earth excavation, 88 cubic yards, at 20 cents..... | 17 60 |
| Stripping, 6,356.7 cubic yards, at 20 cents..... | 1,271 34 |
| Overhauls, 3,059.95 cubic yards, at 18 cents..... | 550 79 |
| Overhauls, 1,932.99 cubic yards, at 36 cents..... | 695 88 |
| Overhauls, 1,596.20 cubic yards, at 54 cents..... | 861 95 |
| Overhauls, 1,439.86 cubic yards, at 72 cents..... | 1,036 70 |
| Overhauls, 121 cubic yards, at 90 cents..... | 108 90 |
| Open drain, 509.7 cubic yards, at 12 cents..... | 61 16 |
| Supervisor's salary, 216 days, at \$3..... | 648 00 |
| Engineering expenses..... | 328 71 |
| Total | \$12,010 88 |

| | |
|---------------------------|----------------|
| Maximum grade before..... | 2.70 per cent. |
| Maximum grade now..... | 1.50 per cent. |

We hereby certify the above statement to be correct and that the pavement was constructed strictly according to the specifications and that the depth of finished pavement was 6 and 8 inches.

Respectfully yours,

J. J. ALBERTSON,
Engineer.
H. W. BREDER,
Supervisor.

MOUNT HOLLY, N. J., November 19th, 1901.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Mount Holly and Jacksonville road, townships of Northampton, Westampton, Eastampton and Springfield, county of Burlington, State of New Jersey. Total length, 3.60 miles.

Width of stone-bed, 10 feet.
 Length of stone-bed, 19,008 feet.
 Depth of stone-bed, 8 inches.

| | |
|---|-------------|
| Macadam, 21,120 square yards, at 84 cents; total..... | \$17,740 80 |
| Drain, 6,361 lineal feet, at 20 cents; total..... | 1,272 20 |
| Supervisor's salary..... | 516 00 |
| Engineering expenses..... | 383 20 |

| | |
|-------------|-------------|
| Total | \$19,912 20 |
|-------------|-------------|

| | |
|-------------------------------|-------------|
| Lump sum, contract price..... | \$17,743 25 |
|-------------------------------|-------------|

| | |
|---------------------------|-------------|
| Maximum grade before..... | 3 per cent. |
| Maximum grade after..... | 2 per cent. |

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 8 inches.

Respectfully yours,

E. D. RIGHTMIRE,

Engineer.

J. W. GASKILL,

Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of High street or Mount Holly road, city of Burlington, county of Burlington, State of New Jersey. Total length, 2,741 feet. Total length, .50 mile.

Width of stone-bed, 16 feet.
 Length of stone-bed, 2,741 feet.
 Depth of stone-bed, 6 inches.

| | |
|---|------------|
| Macadam, 4,765 square yards, at . . cents; total..... | |
| Earth excavation, 823 cubic yards, at . . cents..... | |
| Tile drain, 2,000 lineal feet, at . . cents..... | |
| Lump sum, contract price..... | \$4,150 00 |
| Supervisor's salary..... | 185 00 |
| Engineering expenses..... | 103 00 |

| | |
|-------------|------------|
| Total | \$4,438 00 |
|-------------|------------|

| | |
|---------------------------|--------------|
| Maximum grade before..... | .5 per cent. |
| Maximum grade now..... | .5 per cent. |

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 6 inches.

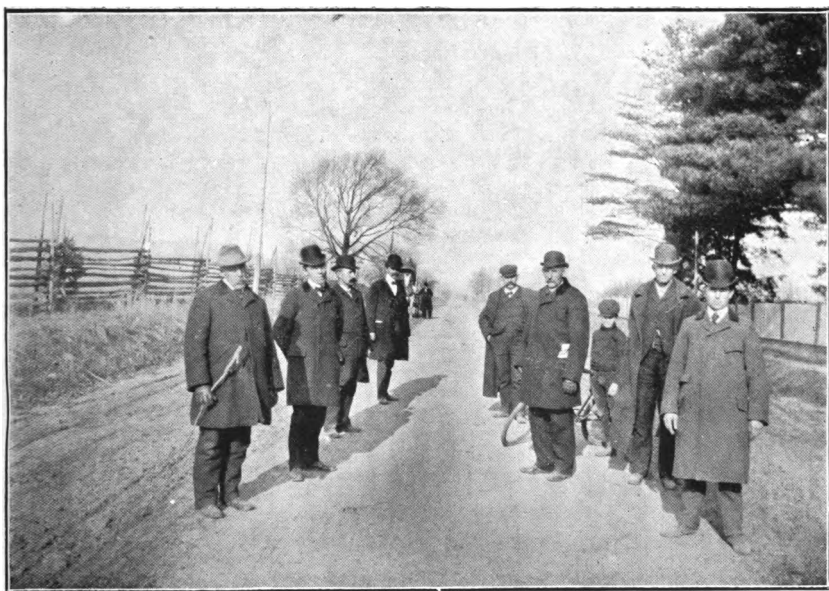
Respectfully yours,

HENRY S. HAMES,

Engineer.

CHAS. P. FARNER,

Supervisor.



Jacksonville, Mt. Holly road, Burlington County, after improvement.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Hutton road, macadamized from Moorestown, and Evesboro road to Mount Laurel road, township of Mount Laurel, county of Burlington, State of New Jersey. Total length, 5,354.1 feet. Total length, 1 mile.

Width of stone-bed, 10 feet.
Length of stone-bed, 5,330 feet.
Depth of stone-bed, 8 inches.

| | |
|--|-------------------|
| Iron pipe (cost of laying)..... | \$60 60 |
| Earth excavation, 765 cubic yards, at township expense..... | 183 00 |
| Wings at each end of road, 91 7-9 square yards, at 90 cents..... | 82 60 |
| Lump sum, contract price..... | 5,300 00 |
| Supervisor's salary..... | 201 00 |
| Engineering expenses..... | 107 65 |
| Total | \$5,691 25 |

Maximum grade before..... 2½ per cent.
Maximum grade now..... 1 per cent.

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 8 inches.

Respectfully yours,
WM. R. LIPPINCOTT,
Engineer.
CHAS. ANDREWS,
Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Batsto and Wading River road, township of Washington, county of Burlington, State of New Jersey. Total length, 51,716 feet. Total length, 9.79 miles.

Width of gravel-bed, 12, 14 and 16 feet.
Length of gravel-bed, 51,716 feet.
Depth of gravel-bed, 6 inches.

| | |
|--|--------------------|
| Total cost of gravel purchased in the bank..... | \$1,144 07 |
| Compact gravel, first haul 12 feet wide, contract price..... | 5,525 37 |
| Stripping, 682 cubic yards, at 12½ cents..... | 85 25 |
| Overhauls from ½ to 2½ miles, and extra width..... | 7,697 24 |
| Supervisor's salary, 112 days, at \$3..... | 336 00 |
| Engineering expenses..... | 608 72 |
| Total | \$15,396 65 |

Maximum grade before.....practically none.
Maximum grade now.....practically none.

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 6 inches.

Respectfully yours,

JNO. W. HARRIS,

Engineer.

E. C. SOOY,

Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Stokes road, township of Medford, county of Burlington, State of New Jersey. Total length, 13,110 feet. Total length, 2.47 miles.

Width of gravel-bed, 16 feet.

Length of gravel-bed, 13,110 feet.

Depth of gravel-bed, 4, 6 and 8 inches.

| | |
|---|-------------------|
| Total cost of gravel purchased in the bank..... | \$179 15 |
| Compact gravel, from beginning to 2½ miles overhauls..... | 2,676 68 |
| Stripping, 8,497 cubic yards, at 12½ cents..... | 1,062 12 |
| Supervisor's salary, 50 days, at \$3..... | 150 00 |
| Engineering expenses..... | 189 06 |
| Total | \$4,256 01 |

Maximum grade before.....practically none.

Maximum grade now.....practically none.

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 4, 6 and 8 inches.

Respectfully yours,

JAMES WILLS,

JNO. W. HARRIS,

Engineers.

HENRY WRIGHT,

Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an estimated detailed statement of the cost of the Haddonfield and Magnolia road, townships of Haddon and Centre, county of Camden, State of New Jersey. Total length, 12,452.5 feet, or 2.35 miles.

Width of stone-bed, 12 feet.

Length of stone-bed, 12,452.5 feet.

Depth of stone-bed, 8 inches.

Number of tons of stone used in construction, 6,198.



Stokes' Gravel road from Ballinger's Mills to Piper's Corner, Burlington County,
before improvement.



Stokes' Gravel road from Ballinger's Mills to Piper's Corner, Burlington County,
after improvement.

| | |
|--|-------------|
| Macadam, 16,624 1-3 square yards, at 86 cents; total..... | \$14,296 92 |
| Earth excavation, 2,352 2-3 cubic yards, at 20 cents; total..... | 470 53 |
| Putting in pipe..... | 70 47 |
| Drain, 200 lineal feet, at 12 cents; total..... | 24 00 |
| Supervisor's salary..... | 450 00 |
| Engineering expenses..... | 460 00 |

Total \$15,771 92

Lump sum, contract price, exclusive of salaries..... \$14,000 00

Maximum grade before..... 5.14 per cent.

Maximum grade after..... 4.16 per cent.

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 8 inches.

Respectfully yours,

J. J. ALBERTSON,

Engineer.

WILLIAM C. WOOD,

Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Ashland road, county of Camden, State of New Jersey. Total length, 11,180 feet, or 2.13 miles.

Width of stone-bed, 10 feet.

Length of stone-bed, 11,127.5 feet.

Depth of stone-bed, 10 inches.

Number of tons of stone used in construction, 6,291.

| | |
|--|-----------|
| Preparation of road-bed (cost)..... | \$413 00 |
| Telford, 12,398.44 square yards, at \$1.10; total..... | 13,638 28 |
| Earth excavation, 1,000 cubic yards, at 20 cents; total..... | 200 00 |
| Supervisor's salary..... | 360 00 |
| Engineering expenses..... | 430 00 |

Total \$15,041 28

Lump sum, contract price..... \$14,000 00

Maximum grade before..... 6.80 per cent.

Maximum grade after..... 4.05 per cent.

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 10 inches.

Respectfully yours,

J. J. ALBERTSON,

Engineer.

WILLIAM C. WOOD,

Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Seashore road, township of Lower, county of Cape May, State of New Jersey. Total length, 31,680 feet. Total length, 6 miles.

Width of gravel-bed, 14 feet.
Length of gravel-bed, 31,680 feet.
Depth of gravel-bed, 8 3-10 inches.

| | |
|--|--------------------|
| Total cost of gravel purchased in the bank, 1,118.95 cars, at \$9.90... | \$11,077 60 |
| Preparation of road-bed (cost), contract..... | 7,438 40 |
| Iron pipe..... | 181 51 |
| Overhauls, 2,496.12 cubic yards, at 22 cents..... | 549 14 |
| Labor | 9 15 |
| Grubbing sidewalks, $\frac{3}{4}$ acre, at \$75,, | 56 25 |
| Supervisor's salary, at \$2.50..... | 262 50 |
| Engineering expenses, salary, 6 miles contract..... | 370 00 |
| Total | \$21,336 18 |
| Gravelling West Cape May, 950 x 14 x 25-100, 287 cubic yards, at 22 cents..... | 63 14 |
| | \$21,399 32 |

Maximum grade before.....practically none.
Maximum grade now.....practically none.

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 8 3-10 inches.

Respectfully yours,

N. C. PRICE,

Engineer.

THOMAS R. WALES,

Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of East Passaic Avenue and Kingsland road, townships of Franklin and Bloomfield, county of Essex, State of New Jersey. Total length, 10,496 feet. Total length, 2 miles.

Width of stone-bed, 16 feet.
Length of stone-bed, 10,496 feet.
Depth of stone-bed, 8 inches.

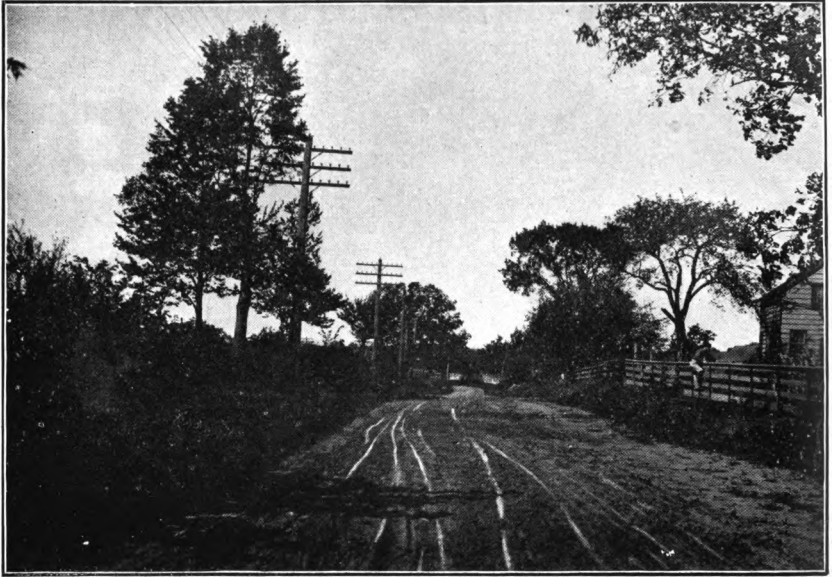
| | |
|--|--------------------|
| Telford, 18,314 square yards, at 52 cents; total..... | \$9,523 28 |
| Earth excavation, 22,372 cubic yards, at 33 cents..... | 7,382 76 |
| Drain to change brook..... | 219 73 |
| Total | \$17,125 77 |
| Maximum grade before..... | 7.2 in 100 |
| Maximum grade now..... | 6.6 in 100 |



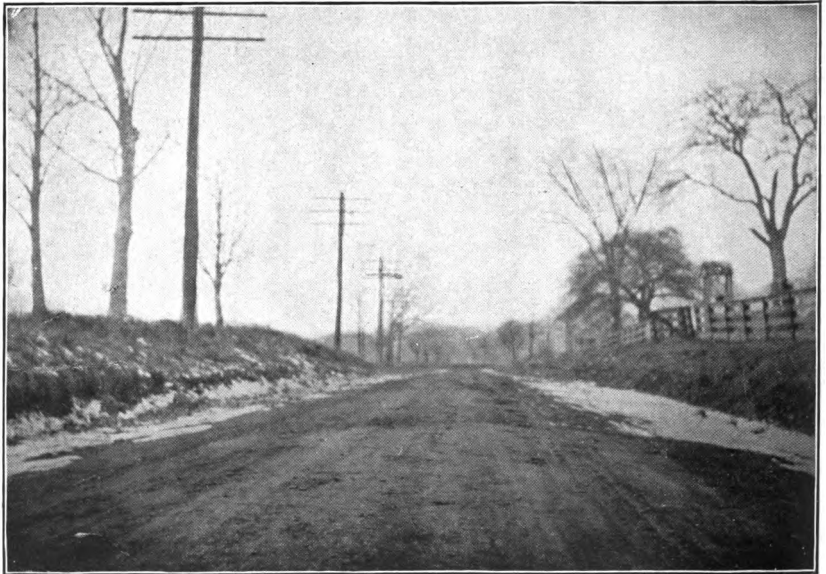
East Passaic Avenue and Kingsland road, Essex County, before improvement.



Kingsland Street, near railroad crossing, Franklin Township, Essex County, after improvement. Eight-inch Telford.



Parsonage Hill road, Essex County. Best part of the road, summer-time 1900, before Macadamizing.



Parsonage Hill road, Essex County. The same road in the winter-time 1901, after Macadamizing. Eight-inch Telford.

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 8 inches.

Respectfully yours,

JAS. OWEN,

Engineer.

SAMUEL E. BLAIR,

TUNIS GARRABRANT,

Supervisors.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Parsonage Hill road, townships of Millburn and Livingston county of Essex, State of New Jersey. Total length, 14,848 feet. Total length, 2.82 miles.

Width of stone-bed, 16 feet.

Length of stone-bed, 14,848 feet.

Depth of stone-bed, 8 inches.

| | |
|--|-------------|
| Telford, 26,478 square yards, at 75 cents; total..... | \$19,858 50 |
| Earth excavation, 16,527 cubic yards, at 40 cents..... | 6,610 80 |
| Total | \$26,469 30 |

| | |
|---------------------------|--------------|
| Maximum grade before..... | 9.85 per 100 |
| Maximum grade now..... | 7.30 per 100 |

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 8 inches.

Respectfully yours,

JAS. OWEN,

Engineer.

GEO. W. REEVE,

Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Eagle Rock road, townships of West Orange and Livingston, county of Essex, State of New Jersey. Total length, 4.54 miles.

Width of stone-bed, 16 feet.

Depth of stone-bed, 8 inches.

| | |
|--|-------------|
| Telford, 42,638 square yards, at 57 cents..... | \$24,303 66 |
| Earth excavation, 22,291 cubic yards, at 35 cents..... | 7,801 85 |
| Total | \$32,105 51 |

| | |
|---------------------------|----------------|
| Maximum grade before..... | 10.53 per 100. |
| Maximum grade now..... | 4.75 per 100. |

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 8 inches.

Respectfully yours,

JAS. OWEN,

Engineer.

J. A. MESLER,

Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the road known as the Bridgeport Macadam road, township of Logan, county of Gloucester, and State of New Jersey. Total length of road (including bridges) 31,782 feet.

Total length of stone-bed, 31,520 feet.

Total length of stone-bed, 6 miles.

Width of stone bed (28,820 ft.), 10 feet.

Width of stone-bed (2,700 ft.), 16 feet.

Depth of stone-bed, 8 inches.

COST.

| | |
|---|-------------|
| Preparation of road-bed and excavations, 6,000 cubic yards, at 25 cents. | \$1,500 00 |
| 36,822 square yards 8-inch macadam, at 55 cents. | 20,252 10 |
| 653 cubic yards open ditches, at 30 cents. | 195 90 |
| 1,314 cubic yards shouldering, at 25 cents. | 328 50 |
| 671 overhauls, at 10 cents. | 67 10 |
| 364 cubic yards clay and gravel for shouldering, at 12 cents. | 43 68 |
| Supervisor's salary, 252½ days, at \$3. | 757 50 |
| Engineering expenses. | 446 87 |
| Cost of advertising for proposals and printing of specifications. | 31 20 |
| Committee expenses. | 40 00 |
| Total | \$23,662 85 |
| Lump sum. | \$22,181 10 |

Maximum grade before. 2½ per cent.

Maximum grade now. 2 per cent.

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was full eight (8) inches.

Respectfully yours,

WM. M. CARTER,

Engineer.

ELWOOD USINGER,

Supervisor.

COMMISSIONER OF PUBLIC ROADS.

97

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Mullica Hill road, townships of Harrison and South Harrison, county of Gloucester, State of New Jersey. Total length, 34,556 feet. Total length, 6.54 miles.

Width of gravel-bed, fourteen (14) feet.

Length of gravel-bed, 34,556 feet.

Depth of gravel-bed, 8 and 10 inches respectively in center, 6 inches on sides.

| | |
|---|--------------------|
| Total cost of gravel purchased in the bank..... | \$697 22 |
| Preparation of road-bed (cost)..... | 1,580 00 |
| Compact gravel, 7,314.64 cubic yards, at intersections, at 26½ cents; total | 1,965 81 |
| Repair work, gravel, 4,305.66 cubic yards, at intersections, at 22 cents; total..... | 947 25 |
| Earth excavation, 437¼ cubic yards, at 25 cents..... | 109 31 |
| Stripping, 48.51 cubic yards, at 14¾ cents..... | 7 16 |
| Overhauls, 15,110.1 cubic yards, at 22 cents..... | 3,324 22 |
| Open drain, 97¼ cubic yards, at 12 cents..... | 11 67 |
| Filling at Mullica Hill causeway, 1,650.81 cubic yards, at 26 cents.. | 429 21 |
| Supervisor's salary, 107 days, at \$3..... | 321 00 |
| Engineering expenses..... | 294 43 |
| Cost of advertising for proposals and printing specifications..... | 31 20 |
| Committee expenses..... | 39 00 |
| Cost of extending wing walls, piling, wharfing, stoning and piping gutters in Harrison township..... | 860 78 |
| Cost of extending culverts in South Harrison township..... | 6 25 |
| Total | \$10,624 51 |

Maximum grade before..... 5 per cent.

Maximum grade now..... 5 per cent.

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 8 and 10 inches respectively.

Respectfully yours,

WM. M. CARTER,

Engineer.

STACY W. HAZELTON,

Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find exact detailed statement of cost of Clayton and Glassboro gravel road, townships of Clayton and Glassboro, county of Gloucester, State of New Jersey. Total length of road, 25,500 feet.

Width of gravel-bed, 24 feet.

Depth of gravel-bed, 8 inches in center, 6 inches at 7 feet each side of the center line, and 1 inch at the sides.

CONSTRUCTION.

| | |
|--|-------------------|
| 25,500 feet road-bed prepared, at 5 cents..... | \$1,275 00 |
| Straightening road, special contract..... | 600 00 |
| 15 cubic yards open ditches, at 2 cents..... | 30 |
| 11,226 cubic yards extra excavations, at 12 cents..... | 1,347 12 |
| 12,324 cubic yards compacted gravel, at 29 cents..... | 3,573 96 |
| 2,086 cubic yards overhauls, at 24 cents..... | 500 64 |
| 2,912 cubic yards overhauls, at 48 cents..... | 1,397 76 |
| 3,007 cubic yards overhauls, at 72 cents..... | 2,165 04 |
| 2,271 cubic yards overhauls, at 96 cents..... | 2,180 16 |
| 2,740 cubic yards stripping, at 20 cents..... | 548 00 |
| | <hr/> \$13,587 98 |

MATERIAL.

| | |
|--------------|--------|
| Gravel | 500 00 |
|--------------|--------|

MISCELLANEOUS.

| | |
|---|-------------------|
| Engineering expenses..... | \$349 75 |
| Supervisor's salary..... | 564 00 |
| Committee expenses..... | 103 25 |
| Advertising and printing..... | 22 44 |
| Surveyors of Highways and Court expenses for straight- ening road..... | 33 00 |
| | <hr/> \$1,072 44 |
| | <hr/> \$15,160 42 |

| | |
|---------------------------|----------------|
| Maximum grade before..... | 1.65 per cent. |
| Maximum grade now..... | .7 per cent. |

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of the finished pavement was 8 and 6 inches.

WILLIAM C. CATTELL,
Engineer.
WESLEY BROWN,
Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of portion of Upper Ferry road, township road, township of Ewing, county of Mercer, State of New Jersey. Total length, 6,875 feet. Total length, 1.30 miles.

Width of stone-bed, 12 feet.
Length of stone-bed, 6,875 feet.
Depth of stone-bed, 6 inches.

| | |
|--|------------------|
| Macadam, 9,194 square yards. | |
| Earth excavation, 5,368 cubic yards..... | \$5,312 00 |
| Tile drain..... | 600 00 |
| Lump sum, contract price..... | 5,312 00 |
| Supervisor's salary..... | 264 00 |
| Engineering expenses..... | 147 80 |
| Total | <hr/> \$6,323 80 |



Clayton and Glassboro road, Gloucester County, south of New Street, looking north, after one year's wear.



Clayton and Glassboro Gravel road, Gloucester County, opposite bog, looking north, after one year's wear.

Maximum grade before..... 5.2 per cent.
Maximum grade now..... 3.66 per cent.

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 6 inches.

Respectfully yours,

FRANK J. EPPELE,
Township Engineer.

GEORGE E. ANDERSON,
Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.

DEAR SIR—Below find an exact detailed statement of the cost of portion of Lower Ferry road, township road, township of Ewing, county of Mercer, State of New Jersey. Total length, 2,723 feet. Total length, .52 mile.

Width of stone-bed, 12 feet.
Length of stone-bed, 2,723 feet.
Depth of stone-bed, 6 inches.

Macadam, 3,716 square yards.
Earth excavation, 1,012 cubic yards, including shortage.
Lump sum, contract price..... \$2,384 00
Supervisor's salary..... 144 00
Engineering expenses..... 59 60

Total. \$2,587 60

Maximum grade before..... 1.7 per cent.
Maximum grade now..... .5 per cent.

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 6 inches.

Respectfully yours,

FRANK J. EPPELE,
Township Engineer.

GEORGE E. ANDERSON,
Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Edinburgh, Windsor and Hightstown road, townships of West Windsor, Washington and East Windsor, county of Mercer, State of New Jersey. Total length, 37,030 feet. Total length, 7.01 miles.

Width of stone-bed, 14 feet.
Length of stone-bed, 37,030 feet.
Depth of stone-bed, class B, or 6 inches.

Macadam, 60,126 square yards.

Earth excavation, 19,450 cubic yards.

Tile drain, 41,899 lineal feet, at 22 cents..... \$9,217 78

Lump sum, contract price..... 44,824 00

Supervisor's salary..... 894 00

Engineering expenses..... 1,351 05

Total \$56,286 83

Maximum grade before..... 7.2 per cent.

Maximum grade now..... 2.58 per cent.

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 6 inches.

Respectfully yours,

FRANK J. EPPELE, C.E.,
County Engineer.

J. G. WILSON,
T. ELY HUTCHINSON,
Supervisors.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of Hutchinson's Mill road, township of Hamilton, county of Mercer, State of New Jersey. Total length, 6,242 feet. Total length, 1.18 miles.

Width of stone-bed, 12 feet.

Length of stone-bed, 6,242 feet.

Depth of stone-bed, class B, or 6 inches.

Macadam, 8,322 square yards.

Earth excavation, 2,065 cubic yards.

Tile drain, 4,800 lineal feet, at 22 cents..... \$1,056 00

Lump sum, contract price..... 5,584 00

Supervisor's salary..... 171 00

Engineering expenses..... 166 00

Total \$6,977 00

Maximum grade before..... 6.6 per cent.

Maximum grade now..... 3.08 per cent.

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 6 inches.

Respectfully yours,

FRANK J. EPPELE, C.E.,
County Engineer.

DANIEL KLOCKNER,
Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the extension of Old York road, township of East Windsor, county of Mercer, State of New Jersey. Total length, 1,915 feet. Total length, .36 mile.

Width of stone-bed, 14 feet.
Length of stone-bed, 1,915 feet.
Depth of stone-bed, class B, or 6 inches.

| | |
|--|-------------------|
| Macadam, 3,108 square yards. | |
| Earth excavation, 1,561 cubic yards, including shortage. | |
| Tile drain, 3,847 lineal feet, at 22 cents..... | \$846 34 |
| Lump sum, contract price..... | 2,395 00 |
| Supervisor's salary..... | 66 00 |
| Engineering expenses..... | 81 03 |
| Total | \$3,388 37 |

| | |
|---------------------------|----------------|
| Maximum grade before..... | 3.55 per cent. |
| Maximum grade now..... | 2.60 per cent. |

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 6 inches.

Respectfully yours,

FRANK J. EPPELE, C.E.,
County Engineer.

W. N. CUNNINGHAM,
Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Hights-town and Manalapan road, township of Monroe, county of Middlesex, State of New Jersey. Total length, 13,385 feet. Total length, 2.53 miles.

Width of stone-bed, 12 feet.
Length of stone-bed, 13,385 feet.
Depth of stone-bed, 8 inches.

| | |
|---|--------------------|
| Macadam, 17,846 square yards, at 96 cents; total..... | \$17,132 16 |
| Earth excavation, 1,500 cubic yards, at 20 cents..... | 300 00 |
| Lump sum, contract price..... | 17,132 16 |
| Supervisor's salary..... | 275 00 |
| Engineering expenses..... | 343 64 |
| Total | \$17,750 80 |

| | |
|--|-------------|
| Maximum grade before..... | 4 per cent. |
| Maximum grade now..... | 2 per cent. |
| One mile paid for this year, cost..... | \$6,729 51 |

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 8 inches.

Respectfully yours,

R. J. DOUGHERTY,
Engineer.

S. E. VAN DENBERGH,
Supervisor.

November 14th, 1901.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Cranbury and Hightstown road, township of Cranbury, county of Middlesex, State of New Jersey. Total length, 7,375 feet, or 1.40 miles.

Width of stone-bed, 12 feet.
Length of stone-bed, 7,375 feet.
Depth of stone-bed, 8 inches.

| | |
|--|------------|
| Macadam, 9,834 square yards, at 96 cents; total..... | \$9,440 64 |
| Macadam spurs, 60 square yards, at 96 cents; total..... | 57 60 |
| Earth excavation, 5,605 cubic yards, at 20 cents; total..... | 1,121 00 |
| Rock excavation..... | 21 00 |
| Drain, 6,188 lineal feet, at 15 cents; total..... | 928 20 |
| Supervisor's salary..... | 174 00 |
| Engineering expenses..... | 196 92 |

| | |
|-------------------------------|-------------|
| Total | \$11,939 36 |
| Lump sum, contract price..... | \$9,472 32 |

| | |
|---------------------------|-------------|
| Maximum grade before..... | 4 per cent. |
| Maximum grade after..... | 2 per cent. |

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 8 inches.

Respectfully yours,

R. J. DOUGHERTY,
Engineer.

JOHN DAVIS,
Supervisor.

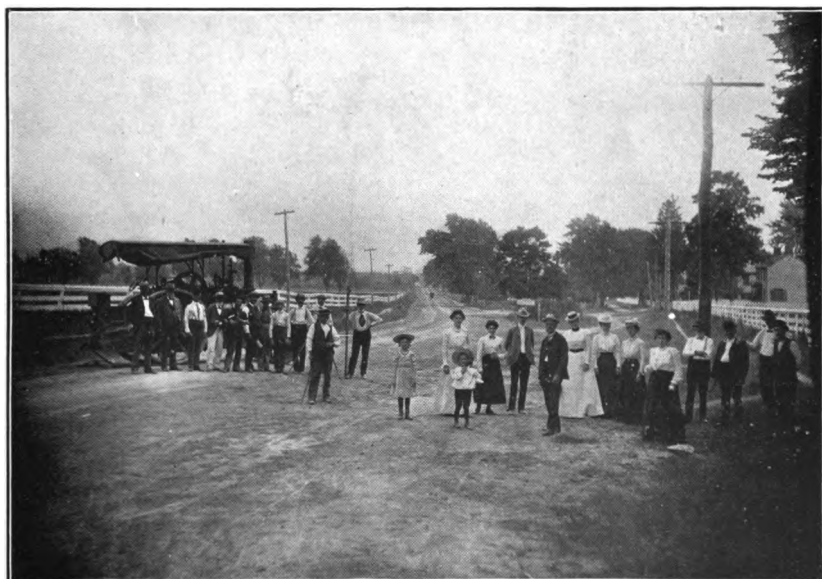
Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Carteret road, township of Woodbridge, county of Middlesex, State of New Jersey, Total length, 8,450 feet. Total length, 1.60 miles.

Width of stone-bed, 12 feet.
Length of stone-bed, 7,471 feet.
Depth of stone-bed, 8 inches.



Cranbury and Hightstown road, Middlesex County, after grading.



Cranbury and Hightstown road Middlesex County, after Macadamizing.
Eight inches of stone.

| | |
|--|------------|
| Macadam, 9,962 square yards, at 69 cents; total..... | \$6,873 78 |
| Earth excavation, 650 cubic yards, at 25 cents..... | 162 50 |
| Placing iron pipe..... | 18 23 |
| Tile drain, 1,100 lineal feet, at 18 cents..... | 198 00 |
| Supervisor's salary..... | 333 00 |
| Engineering expenses..... | 145 05 |

Total \$7,730 56

| | |
|---------------------------|-------------|
| Maximum grade before..... | 4 per cent. |
| Maximum grade now..... | 2 per cent. |

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 8 inches.

Respectfully yours,

ROBT J. DOUGHERTY.

Engineer.

JOSEPH HERMANN,

Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Bergens Mills road, township of Millstone, county of Monmouth, State of New Jersey. Total length, 10,253 feet. Total length, 1.94 miles.

Width of stone-bed, 12 feet.

Length of stone-bed, 10,253 feet.

Depth of stone-bed, 4 inches, and 4 inches iron ore, consolidated foundation.

Number of tons of stone used in construction, about 2,800 tons and 2,800 tons iron ore.

| | |
|---|-------------|
| Macadam, 13,670 2-3 square yards, at 78 cents; total..... | \$10,663 12 |
| Earth excavation, 2,500 cubic yards, at 20 cents..... | 500 00 |
| Tile drain, 3,000 lineal feet, at 10 cents..... | 300 00 |
| Lump sum, contract price..... | 10,997 50 |
| Supervisor's salary..... | 225 00 |
| Engineering expenses..... | 329 92 |

Total \$11,552 42

| | |
|---------------------------|----------------|
| Maximum grade before..... | 2.50 per cent. |
| Maximum grade now..... | 1.40 per cent. |

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 8 inches.

Respectfully yours,

PETER FORMAN,

Engineer.

JOHN J. DAVISON,

Supervisor.

NOTE.—This road was constructed with 4 inches consolidated iron ore for foundation, and 4 inches consolidated stone macadam for top.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Keyport and Keansburg road, township of Raritan, county of Monmouth, State of New Jersey. Total length, 8,000 feet. Total length, 1.51 miles.

Width of stone-bed, 14 feet.

Length of stone-bed, 8,000 feet.

Depth of stone-bed, 8 inches.

Number of tons of stone used in construction, 4,223.50.

| | |
|--|-------------|
| Preparation of road-bed (cost), at 84 cents per yard..... | \$1,050 00 |
| Macadam, 12,444.44 square yards, at 84 cents; total..... | 10,453 33 |
| Gravel, 8,000 square yards..... | |
| Earth excavation, 3,500 cubic yards, at 30 cents..... | 1,050 00 |
| Tile drain, 1,350 lineal feet, at 12 cents..... | 162 00 |
| Tile drain, extra, 3,001 lineal feet, at 12 cents per square yard..... | 360 12 |
| Lump sum, contract price, at 84 cents per square yard..... | 10,453 33 |
| Supervisor's salary, 60 days, at \$3 per day..... | 180 00 |
| Engineering expenses, 3 per cent. of lump sum..... | 313 60 |
| Total | \$11,307 05 |

| | |
|---------------------------|--------------|
| Maximum grade before..... | 4.47 to 100. |
| Maximum grade now..... | 2.8 to 100. |

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 8 inches.

Respectfully yours,

H. S. SPROUL,

Engineer.

JOHN CARR,

Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

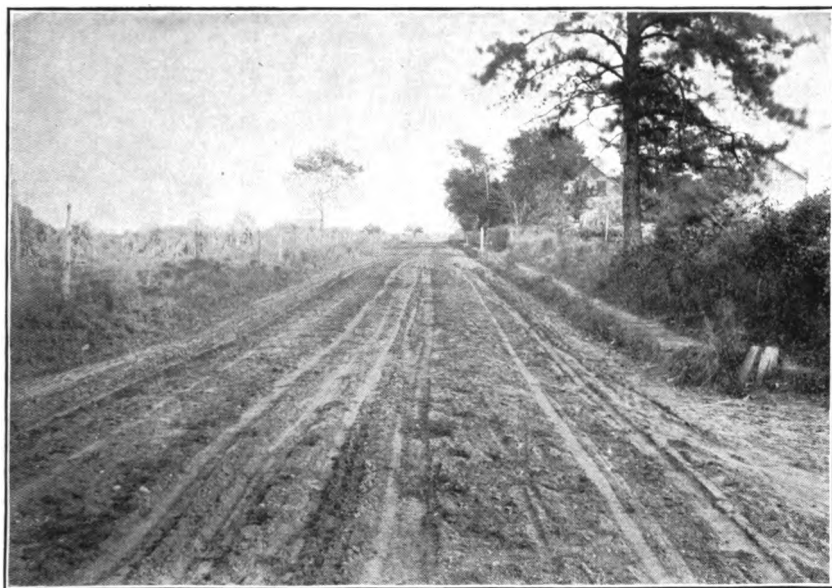
DEAR SIR—Below find a detailed statement of the cost of the Yellow Brook and Turkey road, second section, in Howell township, Monmouth county, New Jersey. Length of road, 17,011 feet.

Width of gravel-bed, 14 feet.

Depth of gravel-bed, compacted, 8 and 9 inches.

ITEMS OF COST.

| | |
|--|------------|
| 17,011 feet preparation of road-bed, at 2 cents..... | \$340 22 |
| 4,000 cubic yards excavation, at 14 cents..... | 560 00 |
| 6,589 cubic yards compacted gravel, at 48 cents..... | 3,162 72 |
| Overhaul of gravel, filling materials, &c., according to specifications..... | 725 00 |
| Stripping gravel-beds in excess of 12 inches..... | 100 00 |
| Rodman and chainmen..... | 18 00 |
| Supervisor's salary..... | 207 00 |
| Engineering expenses..... | 190 00 |
| Total cost..... | \$5,302 94 |



Key Port and Keansburgh road, Monmouth County, before stoning.



Key Port and Keansburgh stone road, Monmouth County. Eight-inch Macadam.

Maximum grade before..... 1.75 per cent.
Maximum grade now..... 1 per cent.

We hereby certify the foregoing statement to be correct, and that the above-named road was constructed strictly according to the specifications, and that the depth of gravel pavement is 8 and 9 inches.

Respectfully yours,

PETER FORMAN,

Engineer.

GEORGE W. PATTERSON, JR.,

Supervisor.

MORRISTOWN, N. J., November 14th, 1901.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Whippany and Parsippany road, township of Hanover, county of Morris, State of New Jersey. Total length, 19,992 feet, or 3.78 miles.

Width of stone-bed, 12 feet.
Length of stone-bed, 19,992 feet.
Depth of stone-bed, 6 inches.

| | |
|---|-------------|
| Macadam, 27,089 square yards, at 52 cents; total..... | \$14,086 28 |
| Overhaulage, 1,573 cubic yards; total..... | 43 16 |
| Cobble gutter, 4,351 square feet, at 10 cents; total..... | 435 10 |
| Earth excavation, 17,391 cubic yards, at 28 cents; total..... | 4,869 48 |
| Rock excavation, 121 cubic yards, at \$1.50; total..... | 181 50 |
| Iron drain pipe, 12-inch, 534 lineal feet, \$1.25; total..... | 667 50 |
| Iron drain pipe, 16-inch, 456.31 lineal feet, at \$1.75; total..... | 798 55 |
| Drain, 142 lineal feet, at 18 cents; total..... | 25 56 |
| Supervisor's salary..... | 303 00 |
| Engineering expenses..... | 568 05 |
| Total | \$21,978 18 |

Maximum grade before..... 8 per cent.
Maximum grade after..... 6 per cent.

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications, and that the depth of finished pavement was 6 inches.

Respectfully yours,

WM. E. KING,

County Engineer.

E. C. QUIMBY,

Supervisor.

MORRISTOWN, N. J., October 14th, 1901.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Brooklyn and Landing road, township of Roxbury, county of Morris, State of New Jersey. Total length, 2,781 feet, or .526 mile.

Width of stone-bed, 12 feet.
 Length of stone-bed, 2,736 feet.
 Depth of stone-bed, 6 inches.

| | |
|--|------------|
| Preparation of road-bed (cost)..... | \$1,098 66 |
| Macadam, 3,648 square yards, at 36 cents; total..... | 1,313 28 |
| Overhaulage, 400 cubic yards, at 2½cents; total..... | 10 00 |
| Earth excavation, 2,859 cubic yards, at 24 cents; total..... | 686 16 |
| Rock excavation, 575 cubic yards, at 70 cents; total..... | 402 50 |
| Iron drain, 84 lineal feet, at \$1.35; total..... | 113 40 |
| Supervisor's salary..... | 159 00 |
| Engineering expenses..... | 61 22 |

Total \$2,745 56

Maximum grade before..... 10 per cent.
 Maximum grade after..... 4 per cent.

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications and that the depth of finished pavement was 6 inches.

WM. E. KING,
County Engineer.
 R. W. MESSINGER,
Supervisor.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below please find detailed statement of the roads constructed in Passaic county during the fiscal year ending October 31st, 1901.

WEST TWENTY-FIFTH STREET.

3,190 square yards 4-inch macadam, at 19½ cents per square yard.. \$622 05

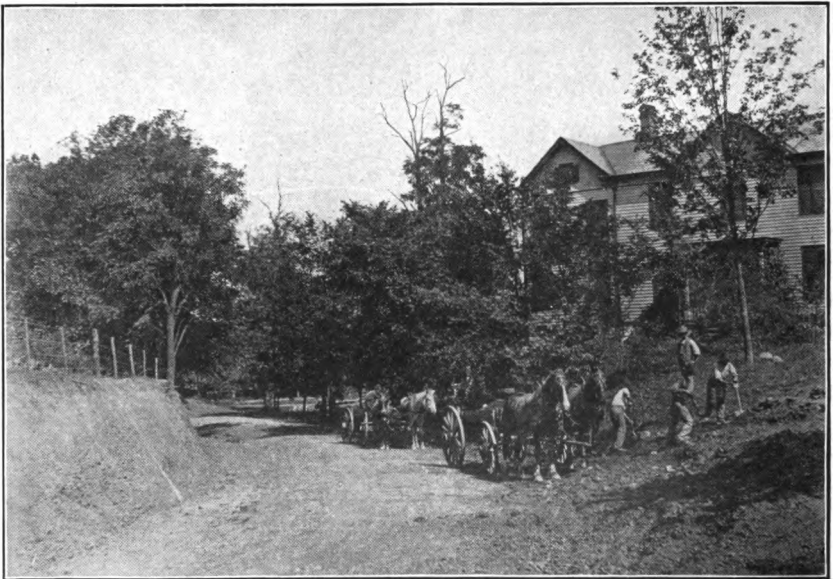
ECHO LAKE AND WEST MILFORD ROAD.

| | |
|---|------------|
| 25,396 square yards macadam, at 24 cents..... | \$6,095 04 |
| 13,669 cubic yards earth excavation or fill, at 20 cents..... | 2,733 80 |
| 2,228.37 cubic yards rock cut, at \$1.50..... | 3,342 56 |
| 611 cubic yards dry wall, at \$1.50..... | 916 50 |
| 113.50 lineal feet 8-inch vitrified pipe, at 50 cents..... | 56 75 |
| 58.60 cubic yards rubble masonry, at \$2..... | 117 20 |
| 30 lineal feet 10-inch vitrified pipe, at 65 cents..... | 19 50 |
| 430 lineal feet of 12-inch vitrified pipe, at 80 cents..... | 344 00 |
| 20 trees removed, at \$4..... | 80 00 |
| 188 lineal feet of 18-inch vitrified pipe, at \$1.10..... | 206 80 |
| 43 days setting fence, at \$1.75 per day..... | 75 25 |
| Extra fill..... | 470 00 |
| 549 feet trench, at 25 cents per foot..... | 137 25 |
| Steps at church..... | 40 00 |

Total \$14,634 65



Pluckamin road at Moore's bridge, Somerset County, N. J., before improvement.



Pluckamin road at Moore's bridge, Somerset County, N. J., after improvement.
Eight-inch Macadam, 12 feet wide.

NORTH SEVENTH STREET.

5,292 square yards 4-inch macadam, at 21 cents per square yard.... \$1,111 32

WILLIAM L. WHITMORE,

County Engineer.

MICHAEL GALLAGHER (W. 25th St.),

THOS. B. VREELAND (Echo Lake Road),

JOHN PATMOS (N. 7th St.),

Dated October, 1901.

Supervisors.

CANNON BALL ROAD.

6,744 square yards 4-inch macadam, at 25 cents per square yard.... \$1,686 00

2,342 cubic yards earth, at 23 cents per cubic yard..... 538 66

273 cubic yards solid rock, at 80 cents per cubic yard..... 218 40

3 cubic yards rubble masonry, at \$1.90 per cubic yard..... 5 70

165 lineal feet 12-inch cast-iron pipe, at \$1.95 per lineal foot..... 321 75

8 lineal feet 12-inch vitrified pipe, at 80 cents per lineal foot.... 6 40

Total cost..... \$2,776 91

WILLIAM L. WHITMORE,

County Engineer.

JOHN J. BARTHOLF,

Supervisor.

SOMERVILLE, N. J., November 1st, 1901.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Pluckamin road, townships of Bridgewater and Bedminster, county of Somerset, State of New Jersey. Total length, 41,860 feet, or 7.93 miles.

Width of stone-bed, 12 and 14 feet.

Length of stone-bed, 41,860 feet.

Depth of stone-bed, 8 and 10 inches.

Number of tons of stone used in construction, approx., 18,995.

8-inch macadam, 13,111.11 square yards, at 50 cents; total..... \$6,555 55

Telford, 43,146.66 sq yards, at 50 cents; total..... 21,573 33

Extra grading at Bedminster..... 200 00

Extra stone at Bedminster..... 46 50

Earth excavation, 15,729 cubic yards.....

Extra stone at Stout's..... 20 00

Drain, 4,000 lineal feet, at 10 cents; total..... 400 00

Ditching, 32,600 lineal feet, at 1 cent; total..... 326 00

Supervisor's salary..... 555 00

Engineering expenses..... 1,811 76

Total \$31,488 14

Lump sum, contract price..... \$28,854 50

Maximum grade before..... 8 per cent.

Maximum grade after..... 5 per cent.

EIGHTH ANNUAL REPORT.

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications and that the depth of finished pavement was 8 and 10 inches.

Respectfully yours,

JOSHUA DOUGHTY, JR.,

Engineer.

CHAS. H. WIKOFF,

Supervisor.

LANDING, N. J., November 20th, 1901.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Lakeside Boulevard, borough of Brooklyn (now Hopatcong), county of Sussex, State of New Jersey. Total length, 4,715 feet, or .893 mile.

Width of stone-bed, 12 feet.
Length of stone-bed, 4,715 feet.
Depth of stone-bed, 6 inches.

| | |
|--|-------------------|
| Macadam, 6,287 square yards, at 44 cents; total..... | \$2,766 28 |
| Earth excavation, 8,387 cubic yards, at 20 cents; total..... | 1,677 40 |
| Rock excavation, 467 cubic yards, at \$1; total. | 467 00 |
| Dry wall, 22 cubic yards, at \$2..... | 44 00 |
| Drain, 406 lineal feet, at \$1.50; total..... | 609 00 |
| Culvert extended 6 feet, at \$1.25; total..... | 7 50 |
| Supervisor's salary..... | 120 00 |
| Engineering expenses..... | 124 00 |
| Total | \$5,815 58 |

Maximum grade before..... 10 per cent.
Maximum grade after..... 6.86 per cent.

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications and that the depth of finished pavement was 6 inches.

Respectfully yours,

WM. E. KING,

Engineer.

R. W. MESSINGER,

Supervisor.

WASHINGTON, N. J., November 14th, 1901.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Morris Turnpike road, township of Washington, county of Warren, State of New Jersey. Total length, 10,521 feet, or 1.98 miles.

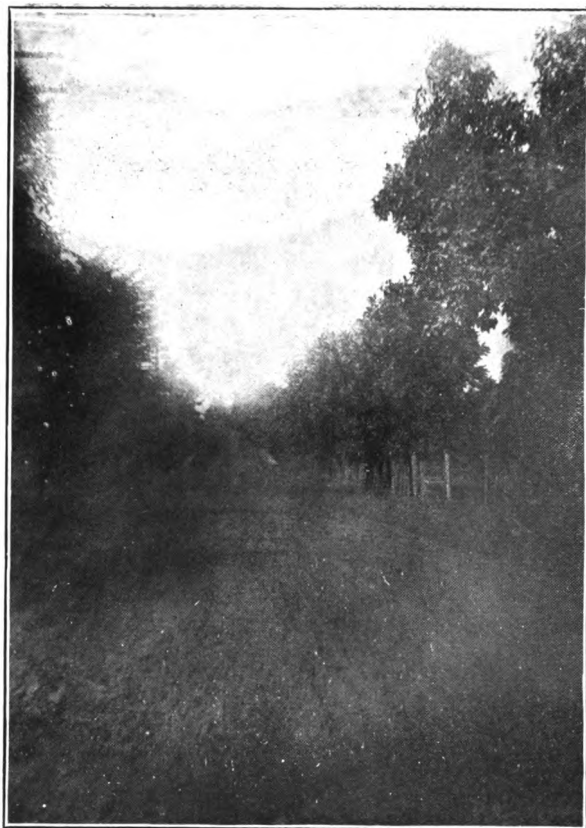
Width of stone-bed, 14 feet.
Length of stone-bed, 10,455 feet.
Depth of stone-bed, 8 inches (loose stone).



Pluckamin road, Hovey's Hill, Somerset County, N. J., before improvement.



Pluckamin road, Somerset County, showing cut on Hovey's Hill.



Morris turnpike, near Bodine's farm, Washington Township, Warren County, before improvement.



Showing finished road near Bodine's Farm, Morris turnpike, Washington Township, Warren County, after improvement.

Macadar
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Rock ex
Train. s
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COMMISSIONER OF PUBLIC ROADS.

109

| | |
|--|--------------------|
| Macadam, 16,263 1-3 square yards, at 59 cents; total..... | \$9,595 37 |
| Earth excavation, 9,119 cubic yards, at 23 cents; total..... | 2,097 37 |
| Rock excavation, 81¼ cubic yards, at \$1.50; total..... | 121 88 |
| Drain, stone, 85 lineal feet, at 12 cents..... | 10 20 |
| Drain, tile, 4-inch, 50 lineal feet, at 30 cents; total..... | 15 00 |
| Supervisor's salary..... | 246 00 |
| Engineering expenses..... | 176 87 |
| Total | \$12,262 69 |

| | |
|---------------------------|----------------|
| Maximum grade before..... | 8.66 per cent. |
| Maximum grade after..... | 5. per cent. |

We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications and that the depth of finished pavement was 7 inches.

Respectfully yours,

WM. E. KING,
County Engineer.
WM. A. WILLEVER,
Supervisor.

HACKETTSTOWN, N. J., November 5th, 1901.

Mr. Henry I. Budd, State Commissioner of Public Roads, Trenton, N. J.:

DEAR SIR—Below find an exact detailed statement of the cost of the Allamuchy road, townships of Allamuchy and Independence, county of Warren, State of New Jersey. Total length, 28,785 feet, or 5.45 miles.

Width of stone-bed (1,028 feet) 16 feet, (27,757 feet) 12 feet.
Length of stone-bed, 28,785 feet.
Depth of stone-bed, 8 inches (loose stone).

| | |
|---|--------------------|
| Preparation of road-bed (cost)..... | \$5,956 72 |
| Macadam, 38,836.89 square yards, at 44 cents; total..... | 17,088 23 |
| Earth excavation, 16,154 cubic yards, at 23 cents; total..... | 3,715 42 |
| Rock excavation, 729 cubic yards, at \$1.50; total..... | 1,093 50 |
| Drain— | |
| 198 feet 16-inch tile pipe, at \$1.10..... | \$217 80 |
| 292 feet 12-inch tile pipe, at 95 cents..... | 277 40 |
| 425 feet 12-inch iron pipe, at \$1.40..... | 595 00 |
| 36 feet 16-inch iron pipe, at \$1.60..... | 57 60 |
| | <hr/> |
| | 1,147 80 |
| Supervisor's salary..... | 395 00 |
| Engineering expenses | 502 85 |
| Total | \$23,942 80 |

| | |
|---------------------------|-----------------|
| Maximum grade before..... | 13.34 per cent. |
| Maximum grade after..... | 9.7 per cent. |

EIGHTH ANNUAL REPORT.

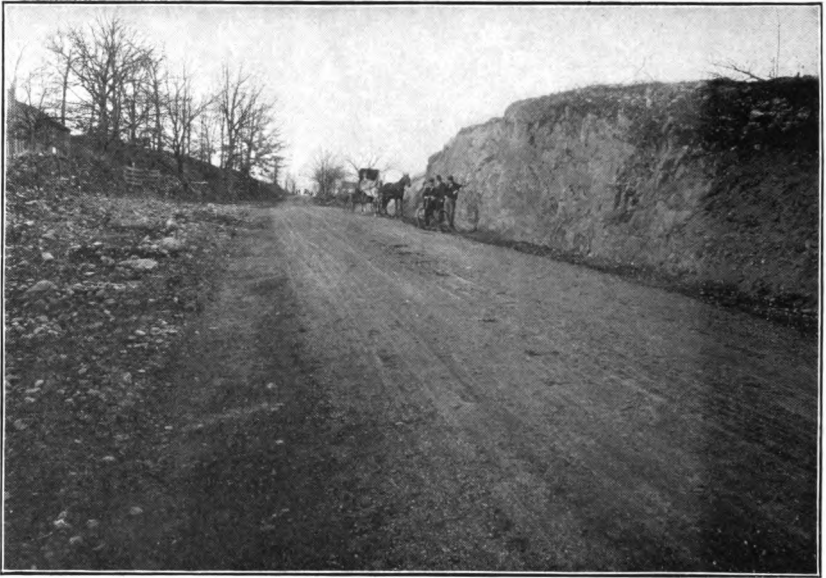
We hereby certify the above statement to be correct, and that the pavement was constructed strictly according to the specifications and that the depth of finished pavement was 6 inches.

Respectfully yours,

WM. E. KING,
County Engineer.
S. C. CUTLER,
Supervisor.

APPENDICES.

(111)



Echo Lake and West Milford road, Passaic County. near Mabie's Hotel, looking north, improved.



Echo Lake and West Milford road, Passaic County, below and looking towards Upper Macopin post office north, improved.

APPENDIX A.

Standard State Aid Specifications for Stone Roads as Amended by the State and County Road Engineers, February 1st, 1901.

SPECIFICATIONS.

For a road in.....County, New Jersey, known as
.....beginning at.....
and extending to.....a distance of
.....feet, or.....miles,
.....feet wide.

WORK TO BE PERFORMED.

1. The work to be performed will consist in furnishing all materials, tools, machinery and labor necessary for the efficient and proper grading of roadway, side ditches and side banks; laying, spreading, rolling of road metal, and leaving the roadway complete in every manner ready for immediate use.

PLANS AND DRAWINGS.

2. The plan, profile and cross-sections on file in the office of the State Commissioner of Public Roads and at the office of.....
.....County Engineer.....
New Jersey, show general location, profile, details and dimensions. The work will be constructed in all respects according to the above-mentioned plans, profile and cross-sections, which form part of these specifications.

3. Any variation of location, profile, size and dimensions from that shown on the plans, as may be required by the exigencies of construction, will, in all cases, be determined by the engineer; but the contractor shall not, on any pretense, save that of the written order of the contracting parties, deviate from the intent of the plans or specifications.

4. On all drawings, figured dimensions are to govern in cases of discrepancy between scale and figures.

GRADING.

5. Under this head will be included all excavation and embankment required for the formation of the highway; cutting all ditches or drains about or contiguous to the road; removing all fences, walls, buildings, trees, poles or other incumbrances, the excavation and embankment necessary for reconstructing cross or branch roads in cases where they are destroyed or interfered with in the formation of the roadway, and all other excavations and embankments connected with or incidental to the construction of the said road.

EXCAVATION.

6. The roadway to the width of.....as shown on plan must be excavated or built to the same curvature as that of the surface of the road when finished; the grade, from center to sides, must be as shown on plans.

7. The earth taken away from any cut or ditch shall be deposited where the engineer may direct, either within or without the lines of the road, but no earth shall be removed from the line of the road without the order of the engineer.

EMBANKMENT.

8. Material taken from the excavations, except when otherwise directed by the engineer, shall be deposited in the embankments, either on the roadway or sidewalks.

9. When there is not sufficient material in the excavations of the road to form the embankments, the deficiency must be supplied by the contractor from without the road. The character of said material and place of excavation must be approved by the engineer. Said material is to be paid for at the same price per cubic yard as specified in the contract for other excavation.

10. The embankments will be formed in layers of such depth, generally twelve (12) inches, and the material deposited and distributed in such manner as the engineer may direct, the required allowance for settling being added.

SLOPES.

11. Slopes in both embankments and excavations shall be one and one-half ($1\frac{1}{2}$) horizontal to one (1) vertical, unless otherwise ordered by engineer.

ROADWAY.

Sub-Foundations.

12. When the excavations and embankments have been brought to a proper depth below the intended surface of the roadway, the cross-section thereof conforming in every respect to the cross-section of the road when

finished, the same shall be rolled with aton.....roller until approved by the Engineer and Supervisor. If any depressions form under such rolling, owing to improper material or vegetable matter, the same shall be removed and good earth substituted, and the whole re-rolled until thoroughly solid and to above-mentioned grade. Water must be applied in advance of the roller, when, in the opinion of the engineer and supervisor, it is necessary.

STONE CONSTRUCTION.

Telford Foundations.

13. After the road-bed has been formed and rolled, as above specified, and has passed the inspection of the engineer and supervisor, a bottom course of stone, of an average depth of.....inches, is to be set by hand as a close, firm pavement, the stones to be placed on their broadest edges lengthwise across the road in such manner as to break joints as much as possible, the breadth of the upper edge not to exceed four (4) inches. The interstices are then to be filled with stone chips, firmly wedged by hand with a hammer, and projecting points broken off. No stone of greater length than ten (10) inches or width of four (4) inches shall be used, except each alternate stone on outer edge, which shall be double the length of the others and well tied into the bed of the road; all stones with a flat, smooth surface must be broken; the whole surface of this pavement to be subjected to a thorough settling or ramming with heavy sledge hammers, and thoroughly rolled with atonroller. No stone larger than two and one-half ($2\frac{1}{2}$) inches to be left loose on top of telford.

MACADAM.

First Course of Broken Stone.

14. After the road-bed has been formed and rolled as above specified, and has passed the inspection of the engineer and supervisor, the first layer of broken stone, consisting of two and one-half ($2\frac{1}{2}$) inch stone, or stone that will pass through a ring three (3) inches in diameter, shall be deposited in a uniform layer, having a depth of.....inches, and rolled repeatedly with aton.....roller until compacted to the satisfaction of the engineer and supervisor. No stone in this course shall be less than two (2) inches in length. Water must be applied in advance of the roller, when, in the opinion of the engineer and supervisor, it is necessary.

15. The depth of loose stone in this and all other courses must be measured by blocks the required thickness of the said loose stone. These blocks to be placed at frequent intervals amid the loose stone when being spread.

**BINDER BETWEEN FIRST AND SECOND COURSE FOR TELFORD
OR MACADAM.**

16. On the first course of stone a quantity of.....binder shall be spread in a uniform layer, and the rolling continued until the stones cease to sink or creep in front of the roller; water will be applied in advance of the roller, if ordered by the engineer. The quantity and quality of this and all other binding to be at all times subject to the approval of the engineer and supervisor.

**SECOND COURSE OF BROKEN STONE FOR MACADAM OR
TELFORD.**

17. The second course of broken stone shall consist of one and one-half ($1\frac{1}{2}$) inch stone; that is, every piece of stone shall be broken so that it can be passed through a ring two (2) inches in diameter, and no stone shall be more than two (2) inches or less than one (1) inch long. This course is to be spread in a uniform layer of.....inches in depth, and rolled until thoroughly settled into place to the satisfaction of the engineer and supervisor. Water will be applied if ordered by the engineer and supervisor.

BINDER ON SECOND COURSE OF STONE.

18. Binder on this course of stone must be applied in the same manner as binder on first course of stone (see Art. 16), as directed by engineer and supervisor.

SURFACE.

19. When the two courses are rolled to the satisfaction of the engineer and supervisor, a coat of fifty (50) per cent. of three-quarters ($\frac{3}{4}$) inch stone and fifty (50) per cent. of screenings, properly mixed, is to be spread of sufficient thickness to make a smooth and uniform surface to the road; then again rolled until the road becomes thoroughly consolidated, hard and smooth.

20. Rolling to be done by contractor with a.....ton..... roller approved by the engineer.

21. Any depressions formed during the rolling, or from any other cause, are to be filled with.....stone and screenings approved by the engineer, and the roadway brought to a proper grade and curvatur as determined by him.

22. Water to be applied in such quantity and in such manner as directed by the engineer and supervisor.

MANNER OF ROLLING.

23. In the rolling the roller must start from the side lines of the stone-bed and work towards the center, unless otherwise directed. The rolling shall at all times be subject to the directions of the engineer and supervisor, who may, from time to time, direct such methods of procedure as in their opinion the necessities of the case may require.

QUALITY OF MATERIAL.

24. All stone must be as nearly cubical as possible, broken with the most approved modern stone crushing machinery, free from all screenings, earth and other objectionable substances, of uniform size, and the same kind and quality, or equally as good in every particular, as that shown in the engineer's office. The one and one-half ($1\frac{1}{2}$) inch stone, three quarter ($\frac{3}{4}$) inch and screenings for binder and final finish must be of the best trap-rock, free from loam or clay.

25. The contractor must furnish samples to the engineer of the kind of stone to be used in the work before the opening of the bids.

26. A shoulder of firm earth or gravel is to be left or made on each side, extending at the same grade and curvature of road to side ditches or gutters. This shoulder is to be rolled according to the directions of the engineer.

SIDE DITCHES OR GUTTERS.

27. The side ditches or gutters are to be excavated as per stakes furnished by engineer, in order to give an easy flow of water, so that no water shall be left standing on the road or in ditches, for all of which no extra payment will be made.

UNDERDRAINS.

28. Underdrains, if found necessary, shall be constructed by the contractor (at prices named in bids) of good four (4) inch.....tile, laid upon a board of not less than one (1) inch in thickness and six (6) inches in width, whenever and wherever the engineer and supervisor shall decide; top of tile or pipe must be at least.....inches deep, unless otherwise directed by the engineer; the joints of the tile or pipe must be covered with salt hay, or material equally as good, and trench filled with pervious earth.

29. When directed by the engineer a stone drain may be used in place of the tile drains. A trench one foot in width and one foot six inches in depth shall be excavated below the sub-grade, said excavation to be filled with loose broken stone to a depth required by engineer.

NO EXTRA PRICE.

30. No allowance in measure of depth of pavement will be made on account of any material which may be driven into the road-bed by rolling. The pavement, when completed, must conform to the grade and cross-section and be satisfactory to the engineer, whose decision shall be final.

31. No extra work will be paid for unless the price has been agreed upon between the contracting parties, including the State Commissioner of Public Roads, and endorsed upon the agreement, witnessed by the engineer.

32. All clay or gravel for shouldering or binder and all extra hauling is to be done at the contractor's expense.

BIDS.

33. Bids will be received under these specifications for the road complete. The prices per yard for excavation, telford, macadam, etc., are intended for the use of the engineer in making estimates to the Board of Chosen Freeholders of work done. No bids will be received in which all of the following items are not filled out:

- (1) Price per cubic yard for earth excavations, without classification, as per cross-sections throughout the length and width of the road.
- (2)
- (3) Price per square yard for telford road complete.
- (4) Price per square yard for macadam road complete.
- (5) Price per lineal foot for underdrains, furnishing all labor and material.
- (6) Price (lump) for the whole road complete, according to above specifications and plans.

ESTIMATE OF QUANTITIES.

34. (1) Excavation, earth.....cubic yards.
 (2)
 (3) Telford.....square yards, as specified.
 (4) Macadam.....square yards, as specified.
 (5) Underdrains.....lineal feet.
 (6)

35. These quantities are result of calculation, but are to be considered as approximate. The county will not be responsible for any excess in above quantities, should any occur. The contractor is expected to satisfy himself, by a personal examination of the work contemplated, about the nature, character and quantity of the labor and material required.

BOND ACCOMPANYING BIDS.

36. Bids shall be accompanied with the bidder's bond in the sum of one thousand dollars, with security satisfactory to the Board of Chosen Freeholders, conditioned that if the contract shall be awarded to him he will, when required by said Board, execute an agreement in writing to perform the work according to the specifications.

LIABILITIES OF CONTRACTOR.

37. He shall maintain sufficient guards by day and night to prevent accidents from travel, and will be liable for any damage which may arise from his neglect to do so, or from any omission on his part.

38. He shall keep the road sprinkled until the final certificate of completion by the engineer is given.

39. He is to commence and prosecute the work upon the road at such points as may be directed by the engineer, withindays from and after the signing of the contract, and shall continue work thereon until completion, except as herein provided.

40. He further agrees to complete the same on or before the.....
.....day of.....A. D.....

Twenty dollars for each day that the work shall remain uncompleted, after the time allowed by contract, may be deducted, as liquidated damages, from any moneys due contractor, unless otherwise agreed upon by the Board of Chosen Freeholders, after presentation of certificate of the engineer recommending the extension of the time limit of completion. A bonus or premium of one dollar per week will be paid the contractor for each week the road is completed before the time specified in the contract.

41. The contractor shall keep the finished roadway and earthwork in repair for the period of one year from the date of its completion and acceptance, during which time he shall be liable for wear and tear caused by ordinary travel, and in addition thereto for as much longer as for any period or periods during said year it shall be out of proper condition. If, during that time, the roadway or any part of the work shall, in the judgment of the engineer and Board of Chosen Freeholders, require repairing and they shall duly notify the contractor to make such repairs as required, and the contractor should refuse or neglect to do so to the satisfaction of the said engineer and Board of Chosen Freeholders within five days from the date of service of notice, then the said engineer and Board of Chosen Freeholders shall have the right to have the work done properly by other parties and pay the expense for the same out of the five per cent. retained.

42. The contractor will be required to preserve all stakes and bench marks made and established on the line of work until duly authorized by the engineer to remove the same.

43. The contractor shall not disturb the position of title stones (the corners of properties adjacent to the road), but where they appear he will either lift or lower them, under the personal supervision of the engineer.

44. The contractor must also preserve the roadway on which he is working from needless obstruction, and where necessary he must construct safe and commodious crossings, to be maintained in good order. He shall afford all proper and reasonable means for the accommodation of the public, and leave the roadway complete in every manner ready for immediate use.

PROVISION FOR DRAINAGE.

45. If it is necessary in the prosecution of the work to interrupt or obstruct the natural drainage of the surface, or the flow of artificial drains, the contractor shall provide for the same during the progress of the work in such a way that no damage shall result to either public or private interests. He shall be held liable for all damages which may result from any neglect to provide for either natural or artificial drainage which he may have interrupted.

RIGHT TO BUILD BRIDGES, CULVERTS, ETC., AND SUSPENSION OF WORK.

46. The right of the county to build bridges, culverts, lay pipes or other appurtenances in said road during the progress of the work, is expressly reserved, as well as suspending the work or any part thereof during the construction of the same, for the purposes above stated, without further compensation to the contractor for such suspension than an extension of time for completing the work as much as it may have been delayed.

STOPPING WORK ON ACCOUNT OF WEATHER.

47. The engineer or supervisor may stop any portion of the work if in their judgment the weather is such as to prevent the same being done properly. No allowance of any kind will be made for such stoppage, except an extension of time for the completion of the work as herein provided.

ABANDONMENT OF CONTRACT.

48. If at any time the work under contract should be abandoned, or if at any time the engineer should judge and so certify in writing that said work, or any part thereof, is unnecessarily delayed, or that the contractor is wilfully violating any of the conditions or covenants of this contract, or is executing the same in bad faith, then, and in that case, the Board of

Chosen Freeholders shall notify the said contractor to discontinue all work under this contract. They may employ other parties to complete the work in such manner as they may decide, and use such material as may be procured upon the line of aforesaid work, and, if necessary, to procure other material for its completion, and charge the expenses of the said labor and material to the contractor, which expense shall be deducted from any moneys due him under contract. In case these expenses shall exceed the sum which would have been payable under contract, if the same had been completed by said contractor, he or his bondsmen shall pay the amount of excess to the Board of Chosen Freeholders on notice from the engineer.

ENGINEER.

49. The engineer is to be selected or appointed by the Board of Chosen Freeholders and paid by them. He is to furnish all surveys, profiles, plans, specifications and estimates of quantities of all kinds before specifications are signed, and in such a clear manner that lump bids can be made upon the work. He shall furnish all lines and grades required for the completion of the work. He is to furnish estimates for quantities of work done before partial payments can be made, the quantity of road laid being determined by surface measurements. Should any difference arise between the contracting parties as to their meanings, his decisions on these matters are to be final and conclusive. The work is to be done according to his directions, and if any material of which he does not approve is brought upon the road, it is to be removed at the expense of the contractor. If the contractor fails or neglects to do any part of the work as specified, or as directed by the engineer, then in that case all other work shall be discontinued on notice from the engineer to the contractor, or to the superintendent or foreman in charge of the work for the contractor, until such time as the work complained of has been done to the satisfaction of the engineer; and the contractor will not be entitled to or allowed any compensation or extension of time for such discontinuation or suspension of the work.

SUPERVISOR.

50. Nothing in these specifications relating to the duties of the engineer shall be taken or construed in any manner to conflict with the duties of the supervisor, as specifically set forth in the act entitled "An act to provide for the more permanent improvement of the public roads of this State," approved March 22d, 1895, and the acts supplementary thereto, but they shall co-operate as far as practicable.

INCOMPETENT WORKMEN.

51. The contractor shall employ competent men to do the work, and whenever the supervisor shall inform him or his representative in charge, in writing, that any man on the work is unfitted for the place, or is working contrary to the provisions of the specifications or the instructions of the engineer and supervisor, he shall thereupon be discharged.

INSPECTION.

52. All directions and determinations necessary to give due and full effect to any of the provisions of these specifications shall be given by the engineer and supervisor.

53. All material and workmanship of any kind shall be subject at all times to the inspection of the engineer and supervisor. Whenever unfaithful and imperfect work is discovered, it shall be immediately repaired or replaced by the contractor, after due notification from the engineer and supervisor.

SUB-LETTING OF CONTRACT.

54. The contractor shall not assign or sub-let any portion of this contract without the consent of the Board of Chosen Freeholders and the State Commissioner of Public Roads.

PAYMENTS.

55.monthly payments will be made by the Board of Chosen Freeholders to the contractor for work performed, upon presentation by him of the proper certificates of the engineer and supervisor, in a sum not to exceed eighty per cent. of the amount then due, together with releases from all liens, if required. Fifteen per cent. will be paid at the completion of the work. The remainder of five per cent. will be retained by the Board of Chosen Freeholders for a period of one year, as provided for in Article 41.

BOND OF CONTRACTOR.

56. The contractor will be required to execute, within five days of giving of contract, a bond in such sum and with such securities as shall be approved by the Board of Chosen Freeholders, conditioned for the faithful performance of the contract, to indemnify and save harmless the said Board of Chosen Freeholders from all suits or actions of any name or description brought against them on account of any act or omission of the contractor or his agents, and for the faithful performance of the con-

tract by the contractor. Said bond shall be in a sum of not less than fifty per cent. of the cost of the road when completed. Any change made in said plans, specifications, agreements or quantities without the consent of the bondsmen shall in no way vitiate said bond. The said contractor hereby further agrees that so much of the money due him, under and by virtue of this agreement, as shall be considered necessary by the Board of Chosen Freeholders, may be retained by them until all such suits or claims for damages aforesaid shall have been settled and evidence to that effect furnished to the satisfaction of the said board of Chosen Freeholders.

CONTRACTOR TO INSURE PAYMENT FOR LABOR, MATERIAL,
ETC., ON FINAL ESTIMATE.

57. The contractor must also furnish said engineer and supervisor with satisfactory evidence that all persons who did work or furnished material for this contract, or who have sustained damage or injury by reason of any act, omission or carelessness on his part or his agents in the prosecution of the work, have been duly paid or secured; he shall also give notice to said engineer and supervisor within ten days after the completion of the work, and before final estimate is made, that any balance for such work or materials, or compensation for such damages due, has been fully paid or released.

The right to increase or decrease the quantity of work and to reject any or all bids is reserved.

.....
County Engineer.

.....
Road Committee.

Approved this.....A. D.
.....by resolution of the Board of Chosen Freeholders.

.....
Director Board of Chosen Freeholders.

.....
Clerk of Board of Chosen Freeholders.

EIGHTH ANNUAL REPORT.

Office State Commissioner of Public Roads, Trenton, N. J.

I have this day carefully read and examined the foregoing specifications, and the same are hereby approved.

Any departure from these specifications which increases the cost of the road must have the written consent of the State Commissioner of Public Roads.

Given under my hand, this.....A. D.....

.....
State Commissioner of Public Roads.

PROPOSAL.

To the Board of Freeholders of the County of.....State of New Jersey:

Gentlemen—The undersigned hereby declares that he has carefully examined the annexed specifications and the drawings therein referred to, and will provide all necessary machinery, tools, apparatus and other means of construction, and do all the work and furnish all the material called for by said specifications, in the manner prescribed by the specifications and the requirements of the Engineer and Supervisor under them for the following prices:

- (1) Price per cubic yard for earth excavations, without classification, as per cross-sections throughout the length and width of the road.
- (2)
- (3) Price per square yard for telford road complete.
- (4) Price per square yard for macadam road complete.
- (5) Price per lineal foot for underdrains, furnishing all labor and material.
- (6) Price (lump) for the whole road complete, according to above specifications and plans.

Accompanying this proposal is an approved bond for the sum of one thousand (\$1,000) dollars, payable to the order of.....
.....County Collector of.....county;
which bond is to be forfeited as liquidated damages if, in case this proposal is accepted, the undersigned shall fail to execute a contract with said Board of Freeholders, under the conditions of this proposal, within the time provided for by the foregoing advertisement for proposals; otherwise, said bond is to be returned to the undersigned.

Signed.....

Address.....

.....N. J.....

CONTRACT.

This agreement, made the.....day of
in the year of our Lord one thousand nine
 hundred.....between The Board of Chosen Freeholders of
 the County of.....party of the first part, and
party of the second part,

Witnesseth, That the said party of the second part, for and in consid-
 eration of the payments hereinafter specified and agreed to be made by
 the party of the first part, hereby covenant and agree to furnish and
 deliver all the materials and to do and perform all the work and labor
 required to be furnished and delivered, done and performed in and about
 the macadamizing of.....
 beginning at.....
 and extending to.....

in the township of.....a distance of.....
 in strict and entire conformity with the plans on file in the engineer's
 office and with the specifications hereto annexed and duly approved by
 resolution of The Board of Chosen Freeholders of the County of.....
 adopted the.....day of.....in the year
 of our Lord one thousand nine hundred.....and approved by
 the State Commissioner of Public Roads on the.....day of
in the year of our Lord one thousand nine hun-
 dred.....which said plans and specifications are hereby made part
 of this agreement as fully and with the same effect as if the same had
 been set forth at length in the body of this agreement.

In consideration of the premises, the party of the first part hereby
 agrees to pay to the party of the second part for said work, when com-
 pleted in accordance with the said specifications, the sum of.....
 payments to be made as provided in said specifications upon presentation
 of the proper certificates of the engineer and supervisor, and upon the
 terms set forth in the annexed specifications.

This contract to be binding upon The Board of Chosen Freeholders of
 the County of.....their successors or assigns and
 upon
 the party of the second part.....

In Witness Whereof, The Director of The Board of Chosen Freeholders
 of the County of.....by authority of a resolution of
 said Board, hath hereunto set his hand and affixed the corporate seal of
 the said Board, and the said party of the second part ha....hereunto set
hand and seal the day and year first above written.

Signed, sealed and delivered in the presence of

.....

(This bond to be filled out and to accompany bid.)

KNOW ALL MEN BY THESE PRESENTS, That we,.....

 are held and firmly bound unto **The Board of Chosen Freeholders** of the
 County of.....in the sum of One Thousand Dollars,
 lawful money of the United States of America, to be paid to the said
The Board of Chosen Freeholders of the County of.....their
 successors and assigns, for which payment, well and truly to be made,
 we bind ourselves, our and each of our heirs, executors and administrators,
 jointly and severally, firmly by these presents.

Sealed with our seals and dated the.....day of
in the year of our Lord one thousand nine
 hundred.....

Whereas, The above bounden.....
 has made a proposal to **The Board of Chosen Freeholders** of the County
 of.....in writing, bearing date the.....
 day of.....in the year of our Lord one thousand nine
 hundred.....

and being hereto annexed, for doing all the work and furnishing all the
 materials for the permanent improvement of the.....
 road in the said County of.....pursuant to an advertise-
 ment published in the.....on the.....
 day of.....one thousand nine hundred.....

Now the Condition of the Obligation is Such, That, in case the contract
 for which said proposal is made shall be awarded to the said.....

.....
 and if.....shall, when required by the said Board, execute an agreement
 to perform the said work and furnish said materials according to the
 specifications annexed to said proposal, then this obligation shall be void,
 or otherwise shall remain in full force and virute.

Signed, sealed and delivered in the presence of

.....

**Standard State Aid Specifications for Gravel Roads as
Amended by the State and County Road
Engineers, February 1st, 1901.**

SPECIFICATIONS.

**For a GRAVEL ROAD in.....County, New Jersey,
known as.....beginning at.....
and extending to.....a distance
of.....feet, or.....miles.**

WORK TO BE PERFORMED.

The work to be performed will consist in furnishing all tools, machinery, and labor necessary for the efficient and proper grading of roadway, side ditches and side banks; laying, spreading and rolling for road material, and leaving the roadway complete in every manner ready for immediate use.

PLANS AND DRAWINGS.

The plan, profile and cross-sections on file in the office of the State Commissioner of Public Roads and at the office of.....County Engineer.....New Jersey, show general location, profile, details and dimensions. The work will be constructed in all respects according to the above-mentioned plans, profile and cross-sections, which form part of these specifications.

Any variation of location, profile, size and dimensions from that shown on the plans, as may be required by the exigencies of construction, will, in all cases, be determined by the engineer; but the contractor shall not, on any pretense, save that of the written order of the contracting parties, deviate from the intent of the plans or specifications.

On all drawings, figured dimensions are to govern in cases of discrepancy between scale and figures.

GRADING.

Under this head will be included all excavations and embankments required for the formation of the highway; cutting all ditches or drains about or contiguous to the road; removing all fences, walls, buildings, trees, poles or other incumbrances, the excavation and embankment necessary for reconstructing cross or branch roads in cases where they are destroyed or interfered with in the formation of the roadway, and all other excavations and embankments connected with or incidental to the construction of the said road.

EXCAVATION.

The roadway to the width of.....as shown on plan must be excavated or built to the same curvature as that of the surface of the road when finished; the grade, from center to sides, must be as shown on plans.

The earth taken away from any cut or ditch shall be deposited where the engineer may direct, either within or without the lines of the road, but no earth shall be removed from the line of the road without the order of the engineer.

EMBANKMENT.

Material taken from the excavations, except when otherwise directed by the engineer, shall be deposited in the embankments, either on the roadway or sidewalks.

When there is not sufficient material in the excavations of the road to form the embankments, the deficiency must be supplied by the contractor from without the road. The character of said material and place of excavation must be approved by the engineer. Said material is to be paid for at the same price per cubic yard as specified in the contract for other excavation.

The embankments will be formed in layers of such depth, generally twelve (12) inches, and the material deposited and distributed in such manner as the engineer may direct, the required allowance for settling being added.

SLOPES.

Slopes in both embankment and excavation shall be one and one-half ($1\frac{1}{2}$) horizontal to one (1) vertical, unless otherwise ordered by the engineer.

ROADWAY.

Sub-Foundations.

When the excavations and embankments have been brought to a proper depth below the intended surface of the roadway, the cross-section, conforming in every respect to the cross-section of the road when finished, the same shall, if ordered by the engineer, be rolled until approved by him. If any depressions form under such rolling, owing to improper material or vegetable matter, the same shall be removed and good earth substituted, and the whole re-rolled until thoroughly solid and to above-mentioned grade.

SHOULDERING.

A shoulder of firm earth or gravel is to be left or made on each side of the gravel bed, extending at the same grade and curvature of road to side ditches or gutters. This shoulder is to be rolled according to the directions of the engineer.

UNDERDRAINS.

Underdrains, if found necessary, shall be constructed by the contractor (at prices named in bids) of good four (4) inch.....tile, laid upon a board of not less than one (1) inch in thickness and six (6) inches in width, whenever and wherever the engineer shall decide; top of tile or pipe must be at least.....inches deep, unless otherwise directed by the engineer; the joints of the tile or pipe must be covered with salt hay, or material equally as good, and trench filled with pervious earth.

When directed by the engineer a stone drain may be used in place of the tile drains. A trench one foot in width and one foot six inches in depth shall be excavated below the subgrade, said excavation to be filled with loose broken stone to a depth required by the engineer.

MATERIAL.

The material to be used in surfacing the road is to be furnished by thewithout any cost to the

The road committee, in conjunction with the engineer, subject to the approval of the Board of Chosen Freeholders, will pass upon and approve all gravel to be used in surfacing the road. The contractor is to dig, cart and place upon the road, in accordance with the specifications, the gravel selected, and use no other. Should any objectionable material be used, he is to remove the same at his own expense.

The contractor must furnish to the engineer samples of the kind of gravel to be used in the work before the opening of the bids.

The gravel is to be placed upon the road in such manner as shall be approved by the engineer, and be thoroughly rolled and solidified until it is consolidated, firm and approved by the engineer. The gravel shall be of such thickness that when it is thoroughly compacted and approved, it shall be.....inches deep in the center and slope at a regular grade to.....inches in depth at a distance of.....feet on each side of the center line.

Should any depressions appear, these are to be carefully filled with gravel, so that the finished road will conform to the approved profile.

The contractor is to be paid by the cubic yard, as per depths above named, for the compacted gravel that he puts on the road, at the price

named in the accepted bid, which shall include finishing the road and shaping the shoulders as above specified.

The contractor is to place sufficient gravel on the road to allow it to shrink thirty-three per cent. in rolling and settling.

OVERHAULS.

(This only to apply when county furnishes the gravel.)

The contractor will not be required to cart any gravel a greater distance than one-half mile without extra pay for each extra half mile of carting or fraction thereof, at a price per compact cubic yard named in his accepted bid.

All gravel used for surfacing found within one-half mile of the place where it is to be used, whether on the line of the road or not, must be carted without extra pay.

SIDEWALK.

The contractor will also be required, when the engineer so directs, to grub and remove from a strip of land.....feet on outside of curbs all materials objectionable to the engineer, such as trees, stumps, roots and brush, and refill the holes with earth, thereby completing the opening of the entire road to a width of.....feet, which shall be.....feet on each side of the center line.

The grubbing and removing of such objectionable material that is ordered by the engineer shall be styled as "grubbing," and paid for by the acre at price named in accepted bid.

STRIPPING GRAVEL BEDS.

(This only to apply when county furnishes gravel.)

Some of the gravel beds are covered with objectionable surface material which must first be removed by the contractor and deposited within one-half mile where the engineer so directs, which shall be paid for by the county at a price per cubic yard named in accepted bid for removing or stripping such objectionable material from top surface of gravel bed. No allowance will be made for removing stumps, trees, brush or roots from gravel pit.

OPEN DITCHES.

The contractor is to grade the shoulders and open all necessary side ditches (as per stakes furnished by the engineer) so that there will be no water allowed to stand by the side of the road or upon it, for which no extra payment will be allowed.

EXTRA DEEP.

Should the road committee so order, the contractor is to build in all respects, as already specified, the gravel bed to a greater depth or thickness than that already named. The contractor is to do the same at a price named per square yard for each extra inch in depth.

NO EXTRA PRICE.

No allowance in measure of depth of pavement will be made on account of any material which may be driven in to the road-bed by rolling. The pavement, when completed, must conform to the grade and cross-section and be satisfactory to the engineer, whose decision shall be final.

No extra work will be paid for unless the price has been agreed upon between the contracting parties, including the State Commissioner of Public Roads, and endorsed upon the agreement, witnessed by the engineer.

BIDS.

Bids will be received under these specifications for the road complete as follows:

- (1) Price per cubic yard for earth excavation, without classification, as per plans and cross-sections throughout the length and width of the road.
- (2) Price per acre for grubbing and removing objectionable material from sidewalks.
- (3) Price per lineal foot for completed tile drain.
- (4) Price per cubic yard for compacted gravel as specified.
- (5) Price per cubic yard for carting gravel more than one-half mile and each additional half mile or fraction thereof.
- (6) Price per cubic yard for stripping or removing earth from top of gravel bed.
- (7) Price per square yard for each ordered inch in depth in excess of thickness named.
- (8) Price (lump) for the whole road complete, according to the specifications and plans prepared by the engineer.

No bid will be received in which all the above items are not filled out. Items No. 5 and 6 only to apply when county furnishes gravel.

The person bidding the lowest on the aggregate of above propositions will be considered the successful bidder (all other things being equal).

ESTIMATE OF QUANTITIES.

| | |
|---|--------------|
| (1) Earth excavations..... | cubic yards. |
| (2) Grubbing | acres. |
| (3) Tile drain..... | lineal feet. |
| (4) Compacted gravel..... | cubic yards. |
| (5) Overhauls | cubic yards. |
| (6) Stripping | cubic yards. |
| Total estimated cost of the road, \$..... | |

These quantities are the result of calculation, but are to be considered as approximate. The county will not be responsible for any excess in above quantities, should any occur. The contractor is expected to satisfy himself, by a personal examination of the work contemplated, about the nature, character and quantity of the labor and material required.

BOND ACCOMPANYING BIDS.

Bids shall be accompanied with the bidder's bond in the sum of one thousand dollars, with security satisfactory to the Board of Chosen Freeholders, conditioned that if the contract shall be awarded to him he will, when required by said Board, execute an agreement in writing to perform the work according to the specifications.

LIABILITIES OF CONTRACTOR.

He shall keep up sufficient guards by day and night to prevent accidents from travel, and will be liable for any damage which may arise from his neglect to do so, or from any omission on his part.

He is to commence and prosecute the work upon the road at such points as may be directed by the Engineer, within.....days from and after the signing of the contract, and shall continue work thereon until completion, except as herein provided.

He further agrees to complete the same on or before the..... day of.....A. D.....

Twenty dollars for each day that the work shall remain uncompleted, after the time allowed by contract, may be deducted, as liquidated damages, from any moneys due contractor, unless otherwise agreed upon by the Board of Chosen Freeholders, after presentation of certificate of the engineer recommending the extension of the time limit of completion. A bonus or premium of one dollar per week will be paid the contractor for each week the road is completed before the time specified in the contract.

The contractor shall keep the finished roadway and earthwork in repair for the period of one year from the date of its completion and acceptance,

during which time he shall be liable for wear and tear caused by ordinary travel, and in addition thereto, for as much longer as for any period or periods during said year it shall be out of proper condition. If, during that time, the roadway or any part of the work shall, in the judgment of the engineer and the Board of Chosen Freeholders, require repairing, and they shall duly notify the contractor to make such repairs as required, and the contractor should refuse or neglect to do so to the satisfaction of the said engineer and the Board of Chosen Freeholders, within five days from the date of service of notice, then the said engineer and the Board of Chosen Freeholders shall have the right to have the work done properly by other parties and pay the expense for the same out of the five per cent. retained.

The contractor will be required to preserve all stakes and bench-marks, made and established on the line of the work, until duly authorized by the engineer to remove the same.

The contractor shall not disturb the position of title stones (the corners of properties adjacent to the road), but where they appear he will either lift or lower them, under the personal supervision of the engineer.

The contractor must also preserve the roadway on which he is working from needless obstruction, and where necessary construct safe and commodious crossings, to be maintained in good order. He shall afford all proper and reasonable means for the accommodation of the public, and leave the roadway complete in every manner ready for immediate use.

PROVISION FOR DRAINAGE.

If it is necessary in the prosecution of the work to interrupt or obstruct the natural drainage of the surface, or the flow of artificial drains, the contractor shall provide for the same during the progress of the work in such a way that no damage shall result to either public or private interests. He shall be held liable for all damages which may result from any neglect to provide for either natural or artificial drainage, which he may have interrupted.

RIGHT TO BUILD BRIDGES, CULVERTS, ETC., AND SUSPENSION OF WORK.

The right of the county to build bridges, culverts, lay pipes or other appurtenances in said road during the progress of the work, as well as suspending the work or any part thereof during the construction of the same, for the purposes above stated, is expressly reserved, without further compensation to the contractor for such suspension than an extension of time for completing the work as much as it may have been delayed by such suspension.

STOPPING WORK ON ACCOUNT OF WEATHER.

The engineer or supervisor may stop any portion of the work if in their judgment the weather is such as to prevent the same being done properly. No allowance of any kind will be made for such stoppage, except an extension of the time for the completion of the work as herein provided.

ABANDONMENT OF CONTRACT.

If at any time the work under contract should be abandoned, or if at any time the engineer should judge and so certify in writing that said work, or any part thereof, is unnecessarily delayed, or that the contractor is wilfully violating any of the conditions or covenants of this contract, or is executing the same in bad faith, then, and in that case, the Board of Chosen Freeholders shall notify the said contractor to discontinue all work under this contract. They may employ other parties to complete the work in such manner as they may decide, and use such material as may be procured upon the line of aforesaid work, and, if necessary, to procure other material for its completion, and charge the expense of the said labor and material to the contractor, which expense shall be deducted from any moneys due him under contract. In case these expenses shall exceed the sum which would have been payable under contract, if the same had been completed by said contractor, he or his bondsmen shall pay the amount of the excess to the Board of Chosen Freeholders, on notice from the engineer.

ENGINEER.

The engineer is to be selected or appointed by the Board of Chosen Freeholders and paid by them. He is to furnish all surveys, profiles, plans, specifications and estimates of quantities of all kinds before specifications are signed, and in such a clear manner that lump bids can be made upon the work. He shall furnish all lines and grades required for the completion of the work. He is also to furnish estimates for quantities of work done before partial payments can be made, the quantity of road laid being determined by surface measurements. Should any difference arise between the contracting parties as to their meaning, his decisions on these matters are to be final and conclusive. The work is to be done according to his directions and if any material of which he does not approve is brought upon the road, it is to be removed at the expense of the contractor. If the contractor fails or neglects to do any part of the work as specified or as directed by the engineer, then in that case all other work shall be discontinued on notice from the Engineer to the contractor; or to the superintendent or foreman in charge of the work for the contractor, until such time as the work complained of has been done to the satisfaction of the engineer; and the contractor will not be entitled to or allowed any compensation or extension of time for such discontinuation or suspension of the work.

SUPERVISOR.

Nothing in these specifications relating to the duties of the engineer shall be taken or construed in any manner to conflict with the duties of the supervisor, as specifically set forth in the act entitled "An act to provide for the more permanent improvement of the public roads of this State," approved March 22d, 1895, and the acts supplementary thereto, but they shall co-operate as far as practicable.

INCOMPETENT WORKMEN.

The contractor shall employ competent men to do the work, and whenever the supervisor shall inform him, or his representative in charge, in writing, that any man on the work is unfitted for the place, or is working contrary to the provisions of the specifications or the instructions of the engineer and supervisor, he shall thereupon be discharged.

INSPECTION.

All directions and determinations necessary to give due and full effect to any of the provisions of these specifications shall be given by the engineer and supervisor.

All material and workmanship of any kind shall be subject at all times to the inspection of the engineer and supervisor. Whenever unfaithful and imperfect work is discovered, it shall be immediately repaired or replaced by the contractor, after due notification from the engineer and supervisor.

SUB-LETTING OF CONTRACT.

The contractor shall not assign or sub-let any portion of this contract without the consent of the Board of Chosen Freeholders and the State Commissioner of Public Roads.

PAYMENTS.

.....monthly payments will be made by the Board of Chosen Freeholders to the contractor for work performed, upon presentation by him of the proper certificates of the engineer and supervisor in a sum not to exceed eighty per cent. of the amount then due, together with releases from all liens, if required. Fifteen per cent. will be paid at the completion of the work. The remainder, or five per cent., will be retained by the Board of Chosen Freeholders for a period of one year, or until the road is finally approved as hereinbefore set forth.

BOND OF THE CONTRACTOR.

The contractor will be required to execute, within five days of giving of contract, a bond in such sum and with such securities as shall be approved by the Board of Chosen Freeholders, conditioned for the faithful performance of the contract, to indemnify and save harmless the said Board of Chosen Freeholders from all suits or actions of any name or description brought against them on account of any act or omission of the contractor or his agents, and for the faithful performance of the contract by the contractor. Said bond shall be in a sum of not less than fifty per cent. of the cost of the road when completed. Any change made in said plans, specifications, agreements or quantities without the consent of the bondsmen shall in no way vitiate said bond. The said contractor hereby further agrees that so much of the money due him, under and by virtue of this agreement, as shall be considered necessary by the Board of Chosen Freeholders, may be retained by them until all such suits or claims for damages aforesaid shall have been settled, and evidence to that effect furnished to the satisfaction of the said Board of Chosen Freeholders.

CONTRACTOR TO INSURE PAYMENT FOR LABOR, MATERIAL,
ETC., ON FINAL ESTIMATE.

The contractor must also furnish said engineer and supervisor with satisfactory evidence that all persons who did work, or furnished material for this contract, or who have sustained damage or injury by reason of any act, omission or carelessness on his part or his agents in the prosecution of the work, have been duly paid or secured; he shall also give notice to said engineer and supervisor within ten days after the completion of the work, and before final estimate is made, that any balance for such work or materials, or compensation for such damages due, has been fully paid or released.

The right to increase or decrease the quantity of work and to reject any or all bids is reserved.

.....
County Engineer.

.....
Road Committee.

Approved this.....day of.....A. D. 190 , by
resolution of the Board of Chosen Freeholders.

.....
Director.

Attest:

.....
Clerk.

Office of State Commissioner of Public Roads, Trenton, N. J.

I have this day carefully read and examined the foregoing specifications, and the same are hereby approved.

Any departure from these specifications which increases the cost of the road must have the written consent of the State Commissioner of Public Roads.

Given under my hand, this.....day of.....A. D. 190

.....
State Commissioner of Public Roads.

PROPOSAL.

*To the Board of Chosen Freeholders of the County of.....State of
New Jersey:*

Gentlemen—The undersigned hereby declares that he has carefully examined the annexed specifications and the drawings therein referred to, and he will provide all necessary machinery, tools, apparatus and other means of construction, and do all the work and furnish all the material called for by said specifications, in the manner prescribed by the specifications and the requirements of the engineer and supervisor under them for the following prices:

- (1) Price per cubic yard for earth excavation, without classification, as per plans and cross-sections, throughout the length and width of the road.....per cubic yard.
- (2) Price per acre for grubbing and removing objectionable material from sidewalks.....per acre.
- (3) Price per lineal foot for completed tile drain.....
per lineal foot.
- (4) Price per cubic yard for compacted gravel as specified.....
per cubic yard.
- (5) Price per cubic yard for carting gravel more than one-half mile and each additional half mile or fraction thereof.....
per cubic yard.

EIGHTH ANNUAL REPORT.

- (6) Price per cubic yard for stripping or removing earth from top of gravel bed.....per cubic yard.
- (7) Price per square yard for each ordered inch in depth in excess of thickness named.....per square yard.
- (8) Price (lump) for the whole road complete, according to the specifications and plans prepared by the Engineer.....

Accompanying this proposal is an approved bond for the sum of one thousand dollars (\$1,000), payable to the order of..... County Collector of.....county; which bond is to be forfeited as liquidated damages if, in case this proposal is accepted, the undersigned shall fail to execute a contract with said Board of Freeholders, under the conditions of this proposal, within the time provided for by the foregoing advertisement for proposals; otherwise, said bond is to be returned to the undersigned.

Signed.....

Address.....

.....N. J.....

CONTRACT.

This agreement, made the.....day ofin the year of our Lord one thousand nine hundred between THE BOARD OF CHOSEN FREEHOLDERS OF THE COUNTY OFparty of the first part, and..... party of the second part,

Witnesseth, That the said party of the second part, for and in consideration of the payments hereinafter specified and agreed to be made by the party of the first part, hereby covenant and agree to furnish and deliver all the materials and do and perform all the work and labor required to be furnished and delivered, done and performed in and about the graveling of..... beginning at..... and extending to..... in the township of.....a distance of..... in strict and entire conformity with the plans on file in the Engineer's office and with the specifications hereto annexed and duly approved by resolution of THE BOARD OF CHOSEN FREEHOLDERS OF THE COUNTY OF

.....adopted the.....day of.....
 in the year of our Lord one thousand nine hundred.....
 and approved by the State Commissioner of Public Roads on the.....
 day of.....in the year of our Lord one thousand nine
 hundred.....which said plans and specifications
 are hereby made part of this agreement as fully and with the same effect
 as if the same had been set forth at length in the body of this agreement.

In consideration of the premises the party of the first part hereby agrees
 to pay to the party of the second part for said work, when completed in
 accordance with the said specifications, the sum of.....

.....
 payments to be made as provided in said specifications upon presentation
 of the proper certificates of the engineer and supervisor, and upon the
 terms set forth in the annexed specifications.

This contract to be binding upon THE BOARD OF CHOSEN FREE-
 HOLDERS OF THE COUNTY OF.....
 their successors or assigns and upon.....

.....
 the party of the second part.....

In Witness Whereof, The Director of THE BOARD OF CHOSEN
 FREEHOLDERS OF THE COUNTY OF.....
 by authority of a resolution of said Board, hath hereunto set his hand
 and affixed the corporate seal of the said Board, and the said party of the
 second part ha..... hereunto set.....hand and seal the day and
 year first above written.

Signed, sealed and delivered
 in the presence of

(This bond to be filled out and to accompany bid.)
 KNOW ALL MEN BY THESE PRESENTS, That we.....

.....
 are held and firmly bound unto THE BOARD OF CHOSEN FREE-
 HOLDERS OF THE COUNTY OF.....in the sum of
 One Thousand Dollars, lawful money of the United States of America, to
 be paid to the said THE BOARD OF CHOSEN FREEHOLDERS OF
 THE COUNTY OF.....their successors and assigns,
 for which payment well and truly to be made we bind ourselves, our and
 each of our heirs, executors and administrators, jointly and severally,
 firmly by these presents.

Sealed with our seals and dated the.....
 day of.....in the year of our Lord one thousand
 nine hundred.....

Whereas, The above bounden.....

 has made a proposal to THE BOARD OF CHOSEN FREEHOLDERS
 OF THE COUNTY OF.....in writing, bearing date the
day of.....in the year of our
 Lord one thousand nine hundred.....

.....
 and being hereto annexed, for doing all the work and furnishing all the
 material for the permanent improvement of the.....
 road in said county of.....pursuant to an advertisement
 published in the.....on the.....day of
one thousand nine hundred.....

Now the Condition of this Obligation is Such, That in case the contract
 for which said proposal is made shall be awarded to the said.....

.....
 and if.....shall, when required by the said Board, execute an agree-
 ment to perform the said work and furnish said materials according to
 the specifications annexed to said proposal, then this obligation shall be
 void, or otherwise shall remain in full force and virtue.

Signed, sealed and delivered
 in the presence of

APPENDIX B.

Following is the text of the State Aid Road Law, with its amendments:

CHAPTER CCXXIII.

An Act to provide for the permanent improvement of public roads of this State.

1. BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey*, That whenever the board of chosen freeholders of any county in this State shall, by resolution, have declared their intention to cause any particular road or section thereof, within such county, to be improved under the provisions of this act, such board shall cause all necessary surveys to be made and specifications to be prepared; the specifications shall require the construction of a macadamized road, or a telford or other stone road, or a road constructed of gravel, oyster shells or other good materials, in such manner that the same, of whatever materials constructed, will, with reasonable repairs thereto, at all seasons of the year, be firm, smooth and convenient for travel; shall be so prepared as to call for bids from which an approximate estimate of the cost can be ascertained, and shall state the amount of security that will be required of the bidder; after said specifications shall have been prepared they shall be submitted to the board of chosen freeholders for their approval or rejection; and if such board shall approve them, they shall then be submitted to the state commissioner of public roads for his approval or rejection; it shall be the duty of the commissioner of public roads, before approving the specification of any road so submitted to him, to ascertain, by personal examination or otherwise, the natural

Board of freeholders may cause road to be improved.

What specifications required.

How prepared.

Freeholders to reject or approve.

Commissioner to examine road and approve specifications.

Cost of all roads not to exceed \$3 1-3 per cent.

May withhold his approval.

Distribute among the counties.

When approved, freeholders must advertise for bids.

Committee to receive bids.

Bidders must give bond.

character of the soil upon which such road is proposed to be constructed, and all other facts that he may deem important, and if, after examination of the specifications and facts so ascertained, he shall be of the opinion that the specifications provide for the construction of a road that will, with reasonable repairs thereto, be firm, smooth and convenient for travel at all seasons of the year, and if he shall also be of the opinion that one-third of the cost of constructing the road or section of road to which such specifications relate, together with one-third of the cost of constructing all other roads and sections of roads in this State under specifications previously approved by him, will not in any one year exceed the sum of one hundred thousand dollars, then he shall approve the specifications, but otherwise he shall reject them; *provided, however*, that he shall, in his discretion, have the power to withhold his approval of any specifications, to the end that the estimated aggregate amount of contracts made in any one year shall not exceed the sum of three hundred thousand dollars, and also to the end that the amounts paid out of the state treasury under the provisions of this act shall in each year be distributed amongst the several counties of the state in such manner as to the said state commissioner of public roads shall seem fair and equitable, and any specifications, the approval of which is withheld as aforesaid, may, if otherwise satisfactory to the said state commissioner of public roads, be approved by him in any year subsequent to the one in which the same may be presented for approval as aforesaid; if the board of chosen freeholders and the state commissioner of public roads shall both approve such specifications, it shall then be the duty of the director of the board of chosen freeholders to advertise in at least two daily newspapers, printed and circulating in the county, for the period of two weeks, or in at least two weekly newspapers, printed and circulating therein, for at least four weeks, for bids to do the work according to the specifications prepared; such advertisements shall state where bidders may find the specifications, and shall name a time and place where the board of chosen freeholders, or a committee of five members thereof, of whom the director shall be one, will meet to receive bids; every such bid shall be accompanied with the bidder's

bond in the sum of one thousand dollars, with security satisfactory to the board, conditioned that if the contract shall be awarded to him he will, when required by the board, execute an agreement in writing to perform the work according to the specifications; no bids shall be received by the board or any member thereof, or by said committee or any member thereof, except at a meeting of said board or committee, of which notice shall be given as aforesaid, and all bids then received shall be immediately publicly read; if the bids shall be received by a committee of the board they shall be reported to the board at the next meeting thereof, with the recommendations of the committee; the board may reject all bids if, in their opinion, good cause exists therefor, but otherwise they shall award the contract to the lowest bidder who shall give satisfactory evidence of his ability to perform the contract; *provided, however*, that the estimated amount of contracts awarded in any one year by any board of chosen freeholders, together with the estimated cost of repairs of roads already constructed, shall not exceed one-fourth of one per centum of the ratables of the county as reported to the state comptroller for the last preceding year; *and provided further*, that in every contract made as aforesaid it shall be specified that at least five per centum of the contract price shall not be paid to the contractor within the period of one year after the work specified to be done by such contract shall have been fully performed and accepted; the bidder to whom the contract may be awarded shall, in addition to executing the agreement to perform the work according to the specifications, also execute to the board of chosen freeholders a bond conditioned for the faithful performance of the contract, in the sum specified in the advertisement for bids, and with such sureties as the board may approve; the contract shall, on behalf of the board of chosen freeholders, be executed by the director thereof, and, when executed by the bidder and said director, a copy of the contract and specifications, with the estimated cost of the work, shall be forthwith filed with the state commissioner of public roads.

Bids, how received.

Limit of county expenditures.

Five per centum to be retained by county.

Contractors must give bond.

Copy of contract and specifications filed with state commissioner.

Commissioner must appoint supervisor.

2. *And be it enacted*, That after a copy of the contracts and specifications shall have been filed with the state commissioner of public roads as aforesaid, the said state commis-

Property-owners nominate supervisor.

Commissioner may remove supervisor.

Supervisor must give his full time to the work.

Supervisor must certify payments.

Freeholders may borrow money temporarily.

sioner of public roads shall, as soon as practicable, appoint a supervisor of the construction of the work under such contract, who shall receive for his services under this act three dollars per day, to be paid out of the county treasury; if the work for which such contract shall be made shall have been petitioned for, pursuant to the provisions of the eighth section of this act, then, if the petitioners therefor, or any of them, shall in writing nominate to the said state commissioner of public roads one or more persons for the position of such supervisor, it shall be the duty of said state commissioner of public roads, if only one nomination be made, to appoint as such supervisor the person so nominated, and, if more than one nomination be made, to appoint as such supervisor one of the persons so nominated, and if no such nomination be made, the said state commissioner of public roads shall then appoint as such supervisor any person whom he may consider competent for such position; the said state commissioner may, however, at any time summarily discharge any supervisor who, in the judgment of the state commissioner, is incompetent or who neglects his duty, and, in such case, shall appoint a new supervisor to take the place of the one so discharged; the supervisor shall supervise all work done under the contract, shall give his whole time thereto, shall require the provisions of the contract to be strictly adhered to by the contractor, and in any case where the contract provides for partial payments during the progress of the work, he shall also, as each payment becomes due, and before payment shall be made, present to the board his certificate, and also the certificate of the surveyor or engineer, if any there be, stating as near as may be the total amount of work done, and that such work has been done in all respects as required by the contract; and the board shall thereupon direct payment to be made by the county collector; *provided*, that no partial payment made during the progress of the work shall exceed eighty per centum of the estimated value of the work done; the board shall have power to borrow on temporary loans on the credit of the county such sums of money for the purpose of carrying on such work as may from time to time become necessary; and when the work shall have been fully completed, and the terms and

conditions of the contract shall have been fully complied with, and such facts shall have been certified to the board to their satisfaction by the supervisor and the surveyor or engineer, if any there be, payment in full shall be made, less the amount required to be withheld for the period of at least one year, as in the next preceding section specified.

3. *And be it enacted*, That when the work under any contract shall have been fully completed, it shall be the duty of the supervisor to prepare a detailed and itemized statement in duplicate of the cost of the improvement, one copy whereof shall be filed with the board of chosen freeholders and one with the state commissioner of public roads.

Supervisor to prepare final certificate.

4. *And be it enacted*, That one-third of the cost of all roads constructed in this state under this act shall be paid for out of the state treasury; *provided*, that the amount so paid shall not in any one year exceed the sum of one hundred thousand dollars; if one-third of such cost shall appear by the statements filed in any one year with the state commissioner of public roads to exceed the said sum of one hundred thousand dollars, then, and in such event, the said sum of one hundred thousand dollars shall be apportioned by the governor and state commissioner of public roads amongst the counties of the state in proportion to the cost of roads constructed therein for such year, as shown by the statements of costs filed in the office of the state commissioner of public roads; the governor and said state commissioner of public roads shall, between December fifteenth and thirty-first in each year, certify to the state comptroller the amount to be paid to each county for such year; and the state comptroller shall thereupon draw his warrants in favor of the respective county collectors for the sums certified as afore-said upon the state treasurer, who shall pay the same out of any moneys in the state treasury not otherwise appropriated.

State to pay one-third cost.

Total state appropriation.

Allotment to be made before December 31st.

Comptroller to draw warrants.

5. *And be it enacted*, That on or before September first in each and every year it shall be the duty of the board of chosen freeholders to certify to the county board of assessors, either in the annual tax budget or separately, two-thirds of the estimated cost of all work for which contracts shall have been awarded under this act during such year; and the

Board of freeholders to certify cost to assessors.

Deficiency,
how met.

county board of assessors shall include the sum so certified in the county taxes assessed for such year, and the same shall be assessed, collected and paid over to the county in the same manner and within the same time that other county taxes are assessed, collected and paid over; if a deficiency shall exist in consequence of the cost exceeding the estimate, or in consequence of the receipt of less than one-third of the cost from the state treasury, the board of chosen freeholders shall have authority to borrow on temporary loans to the amount of such deficiency until the next annual taxes shall be assessed, collected and paid over to the county; and if there be a surplus, in consequence of the cost being less than the estimate, such surplus shall be retained and used in the construction of other roads under this act, or in repairs to roads constructed under this act.

Two-thirds less
one-tenth.

6. *And be it enacted*, That instead of certifying to the county board of assessors two-thirds of the estimated cost of all work for which contracts shall have been awarded under this act in any one year, as required by the fifth section of this act, or two-thirds of said estimated cost, less one-tenth of said estimated cost, as required by the eighth section of this act, the said board of chosen freeholders may, if a resolution to such effect shall be adopted by a vote of at least two-thirds of all its members, borrow such sum or sums of money as may be necessary for the payment of such proportion of said estimated cost by the sale of the bonds of such county, issued in the name of the board of chosen freeholders thereof, and in such sums as the said board may deem proper; said bonds shall bear interest at a rate not exceeding five per centum per annum, shall be sold at not less than their par value, shall not exceed in the aggregate the proportion of the estimated cost of such roads as hereinabove mentioned, shall be so divided that one-tenth of the amount of the proportion of said estimated cost shall fall due in one year from their date, and one-tenth of the proportion of said estimated cost in each successive year thereafter for the period of ten years after their date, and shall be either coupon or registered bonds, as the board of chosen freeholders may determine; the principal and interest thereof may be made payable at the office of the county collector

Bonds, how
sold.

When to ma-
ture.

of such county; said bonds shall be signed by the director of said board and the county collector, and shall be sealed with the seal of the county, and the county collector shall keep a record thereof; it shall be the duty of the board of chosen freeholders each year to place in the tax levy for such county in each year, so long as said bonds shall run, a sufficient sum to pay the interest accruing thereon for said year and the principal of the bonds that shall mature in said year.

Record to be kept.

7. *And be it enacted*, That any road constructed under the provisions of this act, except within the limits of any city, shall forever thereafter be a county road, and the duty of keeping the same in repair, except within the limits of any city, shall devolve upon the board of chosen freeholders and the county supervisor hereinafter mentioned, and all other powers and duties respecting such roads, except within the limits of any city, shall be imposed upon and vested in the said board of chosen freeholders, to the exclusion of all township, borough or other municipal officers excepting city officers; after the first road shall have been constructed under this act in any county, it shall be the duty of the board of chosen freeholders thereof to appoint a county supervisor of roads, who shall hold his office for three years and until his successor is appointed, shall give bond to the board of chosen freeholders in the sum of one thousand dollars conditioned for the faithful performance of the duties of his office, with such sureties as the board may approve, and shall receive such salary or allowance as the board may fix; the board of chosen freeholders shall provide all moneys necessary to keep in a proper state of repair the roads constructed under this act, except within the limits of any city, and may, if there be no moneys on hand that can be lawfully used for such repairs, borrow therefor on temporary loans until the next annual taxes shall have been assessed, collected and paid over to the county; it shall be the duty of the supervisor to report to the board of chosen freeholders, or to the road committee thereof, all repairs he may think necessary or proper to be made to such county roads, and under the direction and control of the said board of freeholders, or its road committee, to expend moneys raised for

County road, township rights acquired.

County supervisor, when appointed.

Compensation to be fixed. Duties of.

County to borrow by temporary loans.

Money, how expended.

County collector to make all payments.

Neglect to repair.
Freeholders to be mandated.

Portion of road within city limits to be kept in repair by the city.

Petition, how signed.

Lineal feet or area.

such repairs in such manner and upon such portions of the roads as will tend to keep them in the best possible state of repair; no part of said moneys shall be paid into the hands of the supervisor but all expenses of repairs shall be paid by the county collector on the orders of the board of chosen freeholders, granted only on the presentation of bills verified by affidavit, as now required by law in the case of other claims against the county; if the board of chosen freeholders shall neglect or refuse to make appropriations sufficient to keep any such road as aforesaid in good repair, any citizen of the county may apply to the supreme court for a writ of mandamus to compel said board to make an appropriation as aforesaid; and when any such application is made, the court, upon a rule to show cause or otherwise, in such manner as the court shall prescribe, shall ascertain and determine whether such road as aforesaid is in a proper state of repair and may also, in its discretion, allow to the attorney of the applicant a reasonable counsel fee to be paid by the county; in case the board of chosen freeholders shall not have on hand sufficient moneys out of which to make the appropriation commanded to be made by any writ of mandamus granted as aforesaid, they shall borrow such sum or sums as may be necessary therefor on temporary loans on the credit of the county, and shall require the amount so borrowed to be raised by taxation with the next assessment of county taxes; it shall be the duty of the authorities of any city within which any portion of road may be constructed under the provisions of this act to keep the portion thereof within such city in repair forever after such construction, and such city shall have the same power, authority and jurisdiction over such portion of such road, and shall have imposed upon it the same duties as were imposed upon and vested in it with respect to such portion of such road before its improvement under the provisions of this act.

8. *And be it enacted*, That whenever there shall be presented to the board of chosen freeholders of any county a petition signed by the owners of at least two-thirds, either in lineal feet or area, of the lands and real estate fronting or bordering on any public road or section of road in such county, taking in said estimate of area all the lands of

every such owner which are assessed for taxes in said county and which lie together in any farm, tract or lot of which a part has a frontage on said road or section of road, praying the board to cause such road or section to be improved under this act, and setting forth that they are willing that the peculiar benefits conferred on the lands fronting or bordering on said road or section shall be assessed thereon in proportion to the benefits conferred to an amount not exceeding ten per centum of the entire cost of the improvement, it shall be the duty of the board to cause such improvement to be made; *provided*, that the road or section desired to be so improved shall be at least one mile in length, or, if it be less than one mile in length, shall be an extension of or connection with some other permanently improved or paved road or street; *and provided further*, that the estimated cost of all improvements made under this act, together with the estimated cost of repairs of roads already constructed in any county in any one year shall not exceed one-fourth of one per centum of the ratables of such county for the last preceding year; *and provided further*, that where more roads are applied for than can be constructed under this act in any one year, the said boards of chosen freeholders shall have the power and authority to select from the roads petitioned for the ones first to be constructed, having regard to the most important roads and the distribution of the benefits of this act to all parts of their counties; it shall not be necessary for the board in any such case to declare by resolution their intention to cause such improvement to be made, but they shall forthwith cause all necessary surveys of such road or section to be made, and specifications to be prepared for a macadamized road, or a telford or other stone road, or a road constructed of gravel, oyster shells or other good material, in such manner that the same, of whatever materials constructed, will, with reasonable repairs thereto, at all seasons of the year, be firm, smooth and convenient for travel; the proceedings shall thereafter be the same as is hereinbefore required in cases where such intention has been declared; if the specifications shall not be approved by the board or by the state commissioner of public roads, or if all the bids for the work shall be rejected, it shall be

Length of road.
If less than one mile.

Estimated cost not to exceed one-fourth of one per centum of ratables.

Board of freeholders to select road under certain circumstances.

Must cause surveys to be made and specifications prepared.
Stone or other good material to be used.

When specifications are not approved or bids rejected.

Other specifications to be made.

No re-advertisement necessary.

After contract awarded, board to certify two-thirds estimated cost, less one-tenth to assessors.

Commissioners to estimate benefits, how appointed.

To give notice of appointment of.

Court to appoint and remove commissioners.

Compensation of.

the duty of the board to cause other specifications to be prepared, or re-advertisements for bids to be made, as often as may be necessary and until a contract shall be awarded, to the end that the improvement prayed for may be completed with reasonable speed; *provided, however*, that no re-advertisement need be made where the lowest bid submitted shows that the improvement prayed for cannot be made within the limit of expenditure in this section above mentioned; in every case where a contract shall be awarded after the presentation of such petition as aforesaid, the board of chosen freeholders, instead of certifying to the county board of assessors two-thirds of the estimated cost of the work, as prescribed by the fifth section of this act, shall, unless they determine to issue bonds in the manner prescribed by the sixth section of this act, which they are hereby authorized to do, certify two-thirds of said estimated cost, less one-tenth of said estimated cost, which sum the county board of assessors shall include in their assessments of county taxes.

9. *And be it enacted*, That when the improvement prayed for as aforesaid shall have been completed and the statement of the cost thereof filed with the board of chosen freeholders, as prescribed by the third section of this act, said board shall apply to the circuit court of the county for the appointment of commissioners to estimate and assess the peculiar benefits conferred by such improvement upon the lands and real estate fronting or bordering on the road or section thereof improved, of the time and place, of which application notice shall be given by ten days' publication in two daily newspapers printed and circulating in the county, or by two weeks publication in two weekly newspapers printed and circulating therein, at which time and place, or at such other time and place as the court shall designate, said court shall, without unnecessary delay, appoint three commissioners, who shall be disinterested freeholders and residents of the county in which the application is made, to estimate and assess the benefits aforesaid; the said court shall have power to remove any commissioner and appoint another in his place and also to fill any vacancy that may occur in the office of any commissioner from any cause; said commis-

sioners shall each receive three dollars per day, to be paid by the county collector.

10. *And be it enacted*, That said commissioners, before entering upon the duties required of them by this act, shall take and prescribe before some person duly authorized to administer the same an oath or affirmation that they will make all assessments and estimates required of them fairly, legally and equitably, according to the best of their skill and understanding, which oath or affirmation shall be attached to the report that they are hereinafter required to make.

Oath of commissioners.

11. *And be it enacted*, That the said commissioners, having thus qualified, shall give such notice as the court may direct of the time and place when and where they will hear any persons in interest who may present themselves to be heard, and at such time and place and at such other times and places to which they may adjourn for that purpose the said commissioners shall attend, and shall give a public hearing to those persons in interest who may desire to be heard; the said commissioners shall have power to examine witnesses under oath or affirmation, to be administered by any one of them, and to enter upon and view the lands and real estate fronting or bordering on the road or section thereof improved, and to adjourn from time to time in their discretion, or as directed by said court; they shall use diligent efforts to ascertain the names of the owners of the lands fronting or bordering on the road or section thereof improved, and shall state the same in the report hereinafter mentioned; but the failure to ascertain the name of any owner, or to state the same correctly, or the omission of any such name from the report, shall not invalidate said assessment nor be a bar to the collection of the same.

Commissioners to give public hearing of time of meeting.

12. *And be it enacted*, That after having given opportunity as aforesaid for a public hearing of the persons in interest, and having viewed the lands fronting or bordering on the road or section thereof improved as aforesaid, the said commissioners shall make a report in writing of their estimates and assessments to the said court, accompanied by a map prepared by the engineer in charge of the construction of the road, showing the several tracts or parcels

Commissioners to report in writing.

Map made by engineer in charge of the road.

Names of property-owners required.

Location of tracts of land.

Court to give notice of hearing.

of land and real estate fronting or bordering on said road or section thereof; the said report shall state the cost of the whole work, which shall be furnished to the commissioners by the board of chosen freeholders from the report of the supervisor of construction filed with said board under the requirement of the third section of this act, and shall give the names, so far as ascertained, of the owners of the tracts or parcels of land and real estate fronting or bordering on said road or section thereof, the city, township, borough or other municipality in which each tract or parcel of lands is situate, and the amount of the assessment upon the owner or owners of each of said tracts or parcels of lands and real estate for the said benefits; which several assessments shall be in proportion, as near as may be, to the peculiar benefits deemed to have been conferred by said improvement upon the respective tracts of lands and real estate aforesaid; if any tract of land shall be located in more than one city, township, borough or other municipality, it shall be stated in said report as being in the city, township, borough or other municipality, in which there is the greatest frontage by lineal feet on the road or section thereof improved; in no case shall any tract or parcel of land and real estate, or any owner thereof, be assessed beyond the amount of benefit actually derived from said improvement, nor shall the aggregate amount of assessments imposed upon the tracts or parcels of land fronting or bordering on such road or section thereof exceed ten per centum of the total cost of the improvement.

13. *And be it enacted*, That upon the coming in of any such report signed by the said commissioners, or any two of them, said court shall cause such notice to be given as it shall deem proper, of the time and place of hearing any objections that may be made to such assessment, and after hearing any matter that may be alleged against the same the said court, either by rule or order, shall confirm the said report, or shall refer the same to the same commissioners for revision and correction, or to new commissioners to be appointed by the said court forthwith to reconsider the subject-matter thereof, and the said commissioners to whom such report shall be so referred by the court shall return the same corrected and

revised, or a new report to be made by them in the premises, to the said court, without unnecessary delay, and the same, being so returned, shall be confirmed, or again referred by the said court in the manner aforesaid, as right and justice shall require, and so, from time to time, until a report shall be made or returned in the premises which said court shall confirm; such report, when so confirmed, shall be final and conclusive, as well upon the said boards of chosen freeholders and the cities, townships, boroughs or other municipalities in which said lands may be situate, as upon the owners of any lands and real estate affected thereby, and the court shall require the same to be forthwith filed with the county clerk, and certified copies thereof and of the accompanying map, and of the rule or order confirming the report, to be promptly delivered to the county collector, one for said county collector and for each city, township, borough or other municipality in which the assessed lands may lie; the county collector shall retain one of the said copies for his own use, and shall forthwith give one to the collector or receiver of taxes in each of the cities, townships, boroughs and other municipalities in which the assessed lands may lie; each city, township, borough or other municipality whose collector or receiver of taxes shall receive such certified copy shall, by its proper disbursing officer, within six months after the date of the said order of confirmation, pay the amount of assessments appearing by said report to have been assessed upon the lands situate in such city, township, borough or other municipality, who shall receive for his services three per centum of the money so collected to be paid by the county.

Court may order new report.

When report is confirmed shall be final and conclusive.

File with county clerk. Copies to county collector and townships, &c.

Township to collect in six months.

14. *And be it enacted*, That no certiorari shall be allowed by any court to review any of the proceedings in relation to such improvement, nor in any way to affect any assessment made by such commissioners, after the lapse of thirty days from the making of the order of the court confirming such assessment; the court shall designate what notice, if any, shall be given by the publication or otherwise of the confirmation of the report of said commissioners.

No certiorari allowed.

15. *And be it enacted*, That the assessments made by said commissioners shall be and remain a lien upon the lands

Assessments to remain a lien on the property.

assessed from the date of the confirmation of the report of assessments in the same manner and to the same extent that taxes are liens upon lots or tracts of land situate in the city, township, borough or other municipality in which the assessed lands may be.

Collector to
notify owners
of lands.

16. *And be it enacted*, That the receiver or collector of said city, township, borough or other municipality shall, as soon as the said report is delivered to him, give to the owners of lots and tracts of lands appearing by said report to be assessed, such notice of the assessments and of the time within which the same are required to be paid, as the court in its order of confirmation, hereinabove mentioned, shall prescribe; all such assessments shall become due and payable to such receiver or collector within six months from the date of the order of confirmation hereinabove mentioned.

Township, &c.,
to bring suits
for collection
of assessments.

17. *And be it enacted*, That if any assessment upon any lot or tract of land made under the provisions of this act shall not be paid within the time appointed in said notice, the township committee, common council or other governing body of the city, township, borough or other municipality within which such lot or tract of land shall be situate, or a majority of them, may, as they shall deem proper, either bring an action on contract in any court of competent jurisdiction, in the corporate name of such city, township, borough, or other municipality, against the owner or owners of such lot or tract of land for so much money laid out and expended by them for the use of such owner or owners and declare generally, and give the special matter in evidence, and either party from any judgment rendered therein may have the same remedy by appeal or otherwise as if said parties were private individuals, or they may proceed to collect the said assessment by sale of the lot or tract of land whereon such assessment has been imposed, or may be a lien, in the same manner and to the same extent as lands are now sold for unpaid taxes in such city, township, borough or other municipality, and the purchaser or purchasers at any such sale or sales, and his legal representatives shall hold and enjoy such lot or tract of land, with the rents, issues and profits thereof, in the same manner and by the same title and tenure as purchasers at the sales of lots or

Either party
may appeal.

Assessments to
be a lien upon
the lands and
sold as lands
are now sold
for taxes.

tracts of land for unpaid taxes can now hold and enjoy the same in such city, township, borough or other municipality.

18. *And be it enacted*, That if any property owners or owner along any road in any county of this state which has not been improved, or is not undergoing improvement, under the previous sections of this act, shall desire any section of any road in such county to be improved, and are or is willing to contribute the whole expense of such improvement, the supervisor of roads of such county shall, upon the written request of such owners or owner, make a plan of such section of road so to be improved, in which shall be given the levels and distances, and also specifications, which shall state the materials that may be used, and the manner of using them; and a copy of such plan, specifications and of any bids to do such work shall then be submitted by such owners or owner to the board of chosen freeholders, and if such board shall approve them, it shall then be lawful for such owners or owner to accept any bid or bids so approved from among the bidders, and proceed to build such section of road according to such plan and specifications, and such owners or owner shall have control of the expenditure of the moneys used to make such improvement, subject to the approval and supervision of the supervisor of such county; and upon the completion of the improvement to the satisfaction of the said supervisor and said board of chosen freeholders, and upon the submission to said board of receipts, showing full payment for materials furnished and work done under the plan and specifications, such section of road so improved shall thereafter be a county road; and the said supervisor shall be paid by the aforesaid owners or owner the sum of ten dollars for making the plan, the sum of five dollars for drawing the specifications, and the sum of five dollars for the supervision of the work, and in case such supervisor is not a civil engineer and an actual survey is necessary, then such owners or owner, at their or his expense, shall procure a survey, which shall be subject to the approval of such supervisor, which survey shall take the place of the plan before mentioned.

Property-owners may improve at their own expense.

Bids and specifications received.

Owners to disburse the money.

Shall be a county road. Fees allowed.

19. *And be it enacted*, That the act entitled, "An act to provide for the more permanent improvement of the public

General repealer.

Proviso.

roads of this state," approved the fourteenth day of April, one thousand eight hundred and ninety-one, and all acts supplementary thereto and amendatory thereof, be and the same are hereby repealed; *provided, however*, that this section shall not cause any proceedings for the improvement of any public road or section thereof under the provisions of the act hereby repealed to abate, but such proceedings may be continued under the provisions of this act in the same manner as if they had been commenced hereunder.

20. *And be it enacted*, That this act shall take effect immediately.

Approved March 22, 1895.

CHAPTER 43.

ACT TO INCREASE APPROPRIATIONS.

A Further Supplement to "An act to provide for the permanent improvement of public roads in this state," approved March twenty-second, one thousand eight hundred and ninety-five.

BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey*:

Appropriation
for public
roads.

1. The sum of one hundred and fifty thousand dollars be and the same is hereby appropriated annually, or so much thereof as may be included in the annual appropriation law, to be paid out of any moneys in the state treasury not otherwise appropriated, for the extension of the benefits and making effective the provisions of the act to which this act is a supplement.

2. This act shall take effect immediately.

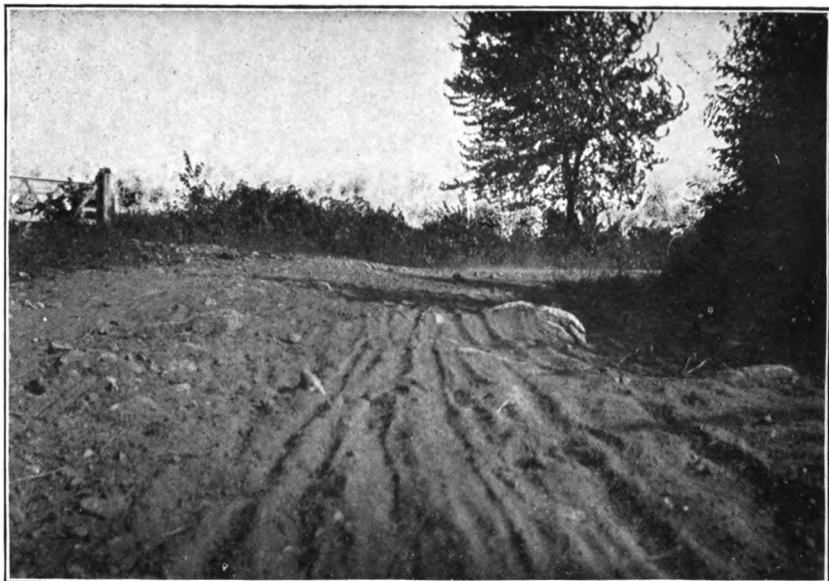
Approved March 17, 1899.

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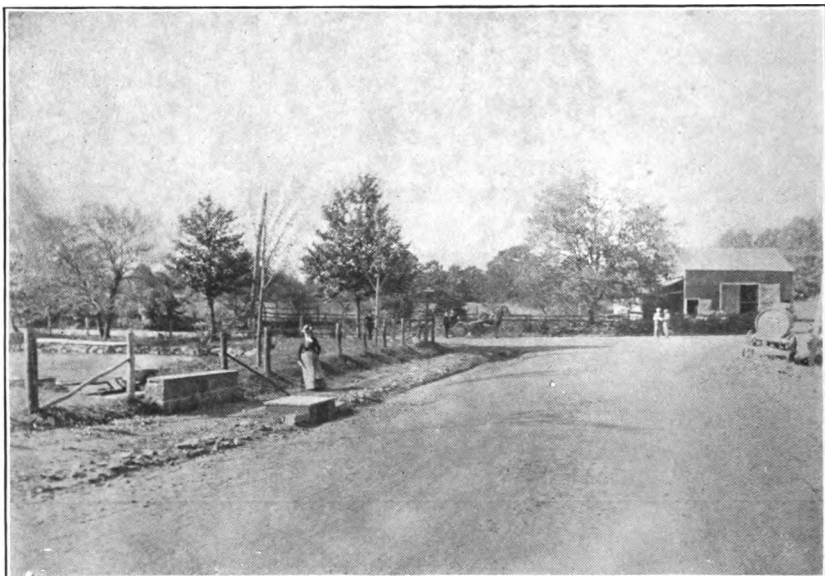
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East Passaic Avenue and Kingsland road. Essex County, before improvement.



Kingsland Street, near county line, Franklin Township, Essex County, after improvement.
Eight-inch Telford.

CHAPTER 44.

STATE AID TO TOWNSHIPS.

Supplement to an act entitled "An act to provide for the permanent improvement of public roads in this State," approved March twenty-second, one thousand eight hundred and ninety-five.

BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey:*

1. Whenever there shall be presented to the township committee, borough, council, board of trustees or commissioners, or other governing body of any township, town, borough, village, or of any municipality governed by a board of commissioners, a petition signed by the owners of at least two-thirds in lineal feet of the lands fronting on any public road or section of road in such township, town, borough, village or municipality, praying such governing body to cause such roads or section to be improved under the act to which this is a supplement, and setting forth that they are willing that the peculiar benefits conferred on the lands fronting on said roads or section shall be assessed thereon, in proportion to the benefits conferred, to an amount not exceeding ten per centum of the entire cost of the improvement, it shall be the duty of such governing body to consider and determine whether the road or section mentioned in such petition is of sufficient general importance to warrant the expenditure necessary for the improvement thereof, and to grant the prayer of such petition or refuse the same if of opinion that the improvement is not of sufficient public importance, or that the expense thereof will be an unnecessary public burden; and in case the prayer of such petition is granted, then such road shall be improved in the same manner and subject to the same regulations, as far as practicable, as in case where a petition is presented to the board of freeholders of any county under the eighth section of the act to which this is a supplement.

When property may be assessed not to exceed 10 per cent. for road benefits.

Construction of
road; supervi-
sion.

2. The said governing body shall cause all necessary surveys to be made, and specifications to be prepared for a macadamized road, or a telford or other stone road, or a road constructed of gravel, oyster shells or other good material, in such manner that the same will, with reasonable repairs thereto, at all seasons of the year, be firm, smooth and convenient for travel, and shall thereafter proceed in the same manner as the board of freeholders is required to proceed by the act to which this is a supplement; and the state commissioner of public roads shall have the same power and authority in respect to the roads authorized by this supplement as by said act are conferred upon him in respect to roads improved under such act.

Supervisor of
construction.

3. The state commissioner of public roads shall appoint as supervisor of the work, such person as shall be nominated by such governing body; such supervisor shall perform the same duties and shall be subject to the same provisions as the supervisor appointed under the act to which this is a supplement, and shall be paid out of the treasury of the township, or other municipality, and shall file one copy of the statement required by the third section of the aforesaid act with the township committee, or other municipal authority, and the other with the state commissioner of public roads.

Proportion of
charges, how
assumed.

4. The aggregate amount of the peculiar benefits conferred on the lands fronting on any road improved under authority of this supplement, not exceeding ten per centum of the entire cost of the improvement, shall be borne by the owners of the land so benefited, one-third of the cost of the improvement (less so much thereof not exceeding one-tenth as shall be assessed upon the property benefited) shall be paid for out of the state treasury; the remaining two-thirds of such cost shall be borne by the said township, or other municipality within which said road is located.

Assessment of
benefits.

5. The amount of peculiar benefits conferred by such improvement on lands fronting on such road shall be assessed on the application of the township committee, or other governing body, in the manner prescribed by the act to which this is a supplement, and all proceedings under this supplement shall conform as far as practicable to the pro-

ceedings authorized and directed by said act, and the said governing body shall, so far as concerns roads constructed by virtue of this supplement, perform the same duties and have the same powers as by said act devolve upon the board of freeholders in respect to roads built under the aforesaid act.

6. Every road constructed under the provisions of this supplement shall thereafter be maintained and kept in repair by the township or other municipality in which such road is situate, in the same manner in all respects as other public roads therein are or may be maintained and kept in repair, and none of the special provisions of the act to which this is a supplement, whereby said road shall be a county charge, shall be applicable to roads built by authority of this supplement.

Maintenance
of roads.

7. This act shall take effect immediately.

Approved March 17, 1899.

DESTROYING POWER TO MANDAMUS.

CHAPTER 168.

A Supplement to an act entitled "An act to provide for the permanent improvement of public roads in this state," approved March twenty-second, one thousand eight hundred and ninety-five.

BE IT ENACTED by the Senate and General Assembly of the State of New Jersey:

1. Whenever there shall be presented to the board of chosen freeholders of any county in this state any petition by the owners of lands praying the said board to cause any road or section thereof to be improved, under the provisions of the act to which this is a supplement, it shall be the duty of such board of chosen freeholders, if they are satisfied that all the provisions and conditions of said act have been met and complied with in and by such petitions, to consider and to determine, by a vote of a majority of all

the members constituting said board, whether the road or section mentioned in said petition is of sufficient general importance to warrant the expenditure of the county and state money for the improvement thereof; and said board of chosen freeholders is hereby authorized, by the vote of a majority of all the members constituting the said board, to grant the prayer of the said petition or to refuse the same if said board shall be of the opinion that the improvement is not of sufficient public importance or that the expense thereof will be an unnecessary public burden; *provided*, that this act shall in no way affect any proceeding heretofore taken to procure a mandamus in case of petition filed under said act.

2. All acts and parts of acts inconsistent with the provisions of this act be and the same are hereby repealed, and this act shall take effect immediately.

Approved April 14, 1896.

CHANGING LOCATION OR IMPROVING.

CHAPTER 75.

An Act to amend an act entitled "An act to provide for the permanent improvement of public roads in this state," approved March twenty-second, one thousand eight hundred and ninety-five.

BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey*:

1. The eighteenth section of the said act shall be amended so as to read as follows:

Property-owners to contribute whole expense of improvement.

18. That if any property owners or owner along any road in any county of this state which has not been improved or is not undergoing improvement under the previous sections of this act shall desire any section of any road in such county to be improved or to be changed in location and improved, and are or is willing to contribute the whole expense of such improvement, and provided every owner of land upon

that part of the road proposed to be vacated under this act shall consent in writing to such vacation, the supervisor of roads of such county shall, upon a written request of such owners or owner, make a plan of such sections of roads so to be improved or changed in location and improved, in which shall be given the levels and distances, and also specifications stating the materials that may be used and the manner of using them; and a copy of such a plan, location, change of location, specifications and of any bids to do such work shall then be submitted by such owners or owner to the board of chosen freeholders, and if such board shall approve them and any change of location which may be proposed, it shall then be lawful for such owners or owner to accept any bid or bids so approved from among the bidders, or at their own expense to proceed to build such section of road according to such plan, location and specifications, and such owners or owner shall have control of the expenditure of moneys used to make such improvements, subject to the approval and supervision of the supervisor of such county; and, upon the completion of the improvement to the satisfaction of the said supervisor and said board of chosen freeholders, and upon the submission to said board of receipts showing full payment for materials furnished and work done under the plan and specifications, such section of road so improved shall, if the board of chosen freeholders shall so declare, thereafter be a county road, but otherwise shall remain an ordinary public highway, and any and all portions of any road now existing which may have been rendered unnecessary or be superseded by the new road so constructed shall be vacated and abandoned as a public road, without other action or proceedings than the approval of the board of chosen freeholders as hereinbefore provided; and the said supervisor shall be paid by the aforesaid owners or owner the sum of ten dollars for making the plan, the sum of five dollars for drawing the specifications, and the sum of five dollars for the supervision of the work, and in case such supervisor is not a civil engineer and actual survey is necessary, then such owners or owner, at their or his expense, shall procure a survey, which shall be subject to the approval of such supervisor, which survey shall take the

Owner to have control of expenditures.

Old road vacated.

place of the plan before mentioned, and shall include all the new roads proposed to be constructed and all the old roads proposed to be abandoned.

Approved March 23, 1896.

INCREASED POWER TO BORROW.

An Amendment to an act entitled "A Supplement to an act entitled 'An act to enable boards of chosen freeholders to acquire, improve and maintain public roads,' " approved March nineteenth, one thousand eight hundred and eighty-nine, which supplement was approved April ninth, one thousand eight hundred and ninety-two.

BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey:*

Section be
amended.

1. The first section of an act entitled "A supplement to an act entitled 'An act to enable boards of chosen freeholders to acquire, improve and maintain public roads,' " approved March nineteenth, one thousand eight hundred and eighty-nine, which supplement was approved April ninth, one thousand eight hundred and ninety-two, be amended so as to read as follows:

BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey:*

Amount au-
thorized to
raise and bonds
issued.

1. In counties of the second class it shall be lawful to raise a sum not to exceed four hundred thousand dollars, for which bonds may be issued by the board of chosen freeholders of any such county, under the act to which this is a supplement or any supplement or amendment thereof; *provided, however,* that if work under said act and supplements or amendments has already been done to an amount exceeding said sum, bonds under said act and supplements may be issued to an amount sufficient to raise and pay for such work; *and provided also,* that no county road bond shall be issued to such an amount as, in addition to existing debt, shall raise the debt of the county for all purposes above three per centum of the assessed value of the real

Proviso.

Proviso.

estate therein; and in case any such bonds shall be issued in excess of the limit aforesaid, all such bonds so issued in excess shall be void in the hands of any person or party, notwithstanding any recitals therein or any representations that may be made concerning the same; in case application has already been made to the circuit court and a certificate shall have been recorded and filed, as required by said act, such application need not be repeated in case of any subsequent issue of such bonds where the original certificate on file shows that the new issue of bonds will not exceed three per centum of the assessed value of the real estate in said county as limited by this act.

2. The second section of said act be amended so as to read as follows:

2. In any county of the second class wherein the board of chosen freeholders thereof shall heretofore or may hereafter issue bonds under said act and supplements, that such board of such county shall not use any of the money so raised for any other purpose except to grade, macadamize or improve any road in any such county, under the provisions of the act to which this is a supplement and the several supplements and amendments thereof; *provided*, nothing herein shall prohibit the doing of the necessary repair of any road heretofore graded, macadamized or improved by any such board or that may be hereafter graded, macadamized or improved under said act and supplements.

Board not to use money raised except to grade, &c.

Proviso.

3. All acts and parts of acts inconsistent herewith be and the same are, so far only as they conflict herewith, repealed, and that this act shall take effect immediately.

Approved March 24, 1897.

CHAPTER 100.

A Supplement to an act entitled "An act to provide for the permanent improvement of public roads in this state," approved March twenty-second, one thousand eight hundred and ninety-five.

BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey:*

Boundary road or street may be improved.

1. Any road or street, or section of road or street, which constitutes the boundary line between two counties, may be acquired, improved and maintained in manner provided for in the act to which this act is a supplement.

Freeholders of adjoining counties may meet to consider improvements.

2. It shall be lawful for the board of chosen freeholders representing adjoining counties which are divided by any road, street or section of road or street, to jointly meet at such time and such place, in either county, as they agree upon, to consider and determine the question of acquiring, improving and maintaining said boundary road or street, or section of road or street, according to the provisions of said act, to the best advantage of the public and the owners of property adjacent thereto; and to that end the said joint board are hereby authorized to prepare maps, plans and specifications, subject to the approval of the commissioner of public roads, for said improvement, which they shall deem necessary and proper for said purposes; the said joint board shall have power to employ a competent engineer or surveyor and such other assistance as they may deem necessary, and upon the completion of said maps, plans and specifications, duplicate copies thereof shall be filed in the office of the clerk of each of the counties affected thereby, and in the office of the commissioner of public roads.

Prepare maps.

Employ engineer.

Make contract.

3. The said joint board may adopt a resolution directing the improvement, as provided for in said act, to be made, and thereupon said joint board shall have full power and authority to enter into contracts with responsible persons for doing the work and furnishing the necessary materials therefor; they shall advertise for proposals in at least two newspapers published in each county, for at least three weeks, and their contracts shall be awarded to and made with the lowest responsible bidder who will comply with the requirements of the joint board and will give ample security for doing the work and performing the contract, but said joint board shall be under no obligation to accept the lowest bid, in which case all other bids will be thrown out and new proposals advertised for in the manner hereinbefore provided.

Payment.

4. The said joint board shall, on the certificate of the engineer and surveyor, and on such other evidence as they

may require as to the work done and materials used and furnished for said improvement, order payments to be made to the contractor or contractors in the manner provided in said act.

5. All costs and expenses incurred in the proceedings hereinbefore authorized shall be borne and paid by each county in equal proportion, and the said joint board shall, after the completion of the contract and acceptance of the improvement, divide the road into two equal sections, and shall designate the section which each county shall maintain and keep in repair, and therefore each of said counties shall maintain and keep in repair the sections of the road so assigned to it.

Expenses
equally di
vided.

Maintenance.

6. Said joint board may choose a chairman and secretary and such other officers, and may make such rules for government as shall be deemed advisable; the said joint board shall have power to meet and adjourn from time to time, and as often as in their judgment it shall be deemed necessary to fully carry into effect the provisions of this act; the votes of a majority of the members of the board of each county voting separately shall be necessary to decide any question, order, motion or resolution which may come before the said joint board; the secretary of said joint board and the engineer and supervisor appointed shall receive such compensation for their services as the said joint board shall, as aforesaid, determine to be just and proper; the members of said board shall be entitled to the same compensation as is allowed to them as members of the board of chosen freeholders, and shall comply with the provisions of and receive the benefits from the act to which this is a supplement, as far as the same is consistent and practical.

Method of
transacting
business by
joint board.

Compensation.

7. This act shall take effect immediately.

Approved March 23, 1898.

An Act to provide for the acquirement of turnpike roads
for free public use.

BE IT ENACTED by the Senate and General Assembly of
the State of New Jersey:

Turnpike roads may be acquired for public use.

Commissioners appointed.

Hearings had.

Notice given.

Temporary loans may be made.

Cost.

Proviso.

1. Whenever there shall be presented to the state commissioner of public roads a petition signed by the owners of at least two-thirds of the land and real estate fronting or bordering on any turnpike road, praying that said road may be acquired for free public use, and setting forth that they are willing that the peculiar benefits conferred on the lands fronting or bordering on said road shall be assessed thereon to an amount not exceeding ten per centum of the entire cost of the said road, then the governor shall appoint five commissioners from the county or counties through which the said road runs; the said commissioners, when appointed, shall take an oath or affirmation faithfully and fairly to perform their duties, and shall thereupon proceed to estimate and determine the fair and just value of the said road, having given ten days' notice of the time and place when and where they will meet to hear any representation in behalf of the said corporation or of the board or boards of chosen freeholders of the various counties through which the said turnpike runs, or of the applying freeholders in the said matter; said notice shall be served upon the president or other chief officer of said corporation, upon the director or clerk of the said board or boards of chosen freeholders, and shall be published at least one week prior to the time of meeting in one newspaper published in each county through which said turnpike runs; such meeting shall be adjourned from time to time at the discretion of the said commissioners; when the said commissioners shall have arrived at a price or value of the said turnpike road satisfactory to themselves they shall report the same to the road commissioner, who may thereupon ratify the same and report it to the board or boards of chosen freeholders of the counties through which the said road runs, who may thereupon purchase the same; and they are hereby empowered to make temporary loans upon the credit of the said county or counties for the acquirement of the said roads as aforesaid.

2. One-third of the cost of all roads so acquired under this act shall be paid for out of the state road appropriation; *provided*, that the amount so paid shall not in any one year exceed the amount of twenty thousand dollars; if one-third of such cost shall exceed the sum of twenty thou-

said dollars the said sum of twenty thousand dollars shall be apportioned by the governor and the state commissioner of public roads among the counties of this state in proportion to the cost of the roads acquired by them for such year, as shown by the statement of cost filed in the office of the state commissioner of public roads; the governor and the said commissioner shall, between December fifteenth and thirty-first in each year, certify to the state comptroller the amount to be paid to each county for such year, and the state comptroller shall thereupon draw his warrants in favor of the respective county collectors for the sums certified to as aforesaid upon the state treasurer, who shall pay the same out of any moneys in the state treasury not otherwise appropriated; *provided, further*, that the cost of all turnpike roads acquired under this act in any county in any one year, together with all roads built or repaired, shall not exceed one-fourth of one per centum of the ratables of such county for the last preceding year. Proviso.

3. On or before August first in each and every year it shall be the duty of the board of chosen freeholders to certify to the county board of assessors, either in the annual tax budget or separately, the two-thirds of the cost of all turnpike roads acquired so as aforesaid during the year, and the county board of assessors shall include the sum so certified in the county taxes assessed for such year, and the same shall be assessed, collected and paid over to the county in the same manner and within the same time that other county taxes are assessed, collected and paid over; if a deficiency shall exist in consequence of the receipt of less than one-third of the cost from the state treasury, the board of chosen freeholders shall have authority to borrow on temporary loans to the amount of such deficiency until the next annual taxes shall be assessed, collected and paid over to the county. Assessors to include certain amount in county taxes.
Deficiency.

4. If the said road shall run through more than one county the petition to the state commissioner of public roads shall be signed by at least two-thirds of the owners of the land and real estate bordering on said road in each county before the governor shall be required to appoint the five commissioners mentioned in the first section of this act; and each of the said counties shall bear the expenses of the acquirement of If the road is in more than one county.

the said road in proportion to the length thereof within the said counties, and all proceedings after the appointment of the said five commissioners that may be required by virtue of this act shall be had separately and independently in each of the said counties.

Road to be
free and main-
tained by
county.

5. Any road so acquired shall forever thereafter be a free county road, and the duty of keeping the same in good order and repair shall devolve upon the county officers in like manner as heretofore provided for free stone roads.

Benefits as-
sessed by com-
missioners ap-
pointed by
court.

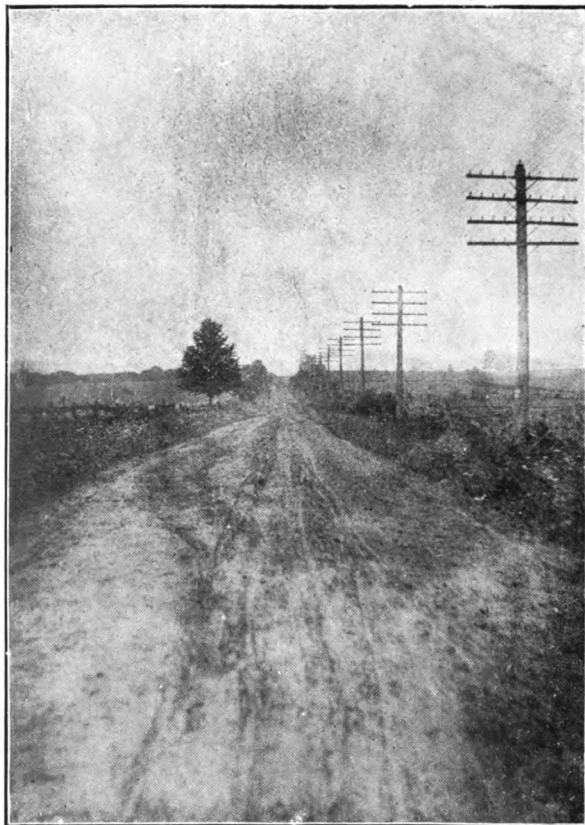
6. When the said turnpike roads shall have been so acquired the board of chosen freeholders shall apply to the circuit court of the county for the appointment of commissioners to estimate and assess the peculiar benefits conferred by such acquirement upon the lands and real estate bordering on the road so acquired, of the time and place of which application notices shall be given by ten days' publication in two daily newspapers printed and circulating within the said counties, then by two weeks' publication in two weekly newspapers printed and circulating therein, at which time and place or at such other time and place as the court shall designate, shall, without unnecessary delay, appoint three commissioners, who shall be freeholders, and residents of the county in which the application is made, to assess the benefits aforesaid; the said court shall have power to remove any commissioner and appoint another in his place and also to fill any vacancy that may occur in the office of any commissioner at any time.

Method of as-
sessing bene-
fits.

7. The said commissioners shall then proceed in like manner as the commissioners appointed to assess the benefits conferred by the improvement of the public roads of this state under and by virtue of an act of the legislature entitled "An act to provide for the permanent improvement of the public roads of this state," approved March twenty-second, one thousand eight hundred and ninety-five, and the supplements thereto, and the report of the said commissioners when filed and approved shall be a lien upon the properties assessed in like manner, and the said assessment shall be collected in like manner as the assessment in the said act last before mentioned.

8. This act shall take effect immediately.

Approved May 11, 1897.



Showing grade of road near Larison's Mill, west of Pohatcong Creek, Morris turnpike, Washington Township, Warren County, before improvement.

CHAPTER 132.

An Act to provide for the acquirement of turnpike roads for free public use, and for the permanent improvement and maintenance of the same.

BE IT ENACTED by the Senate and General Assembly of the State of New Jersey:

1. Whenever there shall be presented to the state commissioner of public roads a petition signed by the owners of at least two-thirds of the land and real estate fronting or bordering on any turnpike road, praying that said road may be acquired for free public use, and setting forth that they are willing that the peculiar benefits conferred on the lands fronting or bordering on said road shall be assessed thereon to an amount not exceeding ten per centum of the entire purchase price of the said road, together with the amount necessary to resurface, rebuild or improve the said road in the manner prescribed for other roads in the act entitled "An act to provide for the permanent improvement of the public roads in this state," approved March twenty-second, anno domini one thousand eight hundred and ninety-five, and the supplements thereto, said commissioner shall thereupon notify the governor of such action and the governor shall thereupon appoint five commissioners from the county or counties through which the said road runs; the said commissioners when appointed shall take an oath or affirmation faithfully and fairly to perform their duties, and shall thereupon proceed to estimate and determine the fair and just value of the said road and of the portions thereof in each county in which the same is located, having given ten days' notice of the time and place when and where they will meet to hear any representation in behalf of the said corporation or of the board or boards of chosen freeholders of the various counties through which the said road runs, or of the applying freeholders in the said matter; said notice shall be served upon the president or other chief officer of the turnpike company, upon the director of the said board or boards of chosen freeholders, and shall be published at

Acquirement
of turnpike
road for free
public use.

Appointment
of commission-
ers by gover-
nor.

Hearing.

Report to state
commissioner
of roads.

least one week prior to the time of meeting in one newspaper published in each county through which said turnpike runs; such meeting shall be adjourned from time to time at the discretion of the said commissioners; when the said commissioners shall have arrived at a price or value of the said turnpike road satisfactory to themselves they shall report the same to the state commissioner of public roads, who may thereupon ratify the same and report it to the board or boards of chosen freeholders of the counties through which the said road runs, which said board may thereupon purchase the same or whenever the board of chosen freeholders of any county in this state shall agree with the owner or owners of any turnpike road or toll road within such county upon the price to be paid for such turnpike road or toll road, and shall by resolution accept the same, and said proceeding be approved by the state commissioner of public roads in writing, said board may thereupon purchase the same and said road shall be paid for and maintained as a county road as hereinafter provided for; and they are hereby empowered to make temporary loans upon the credit of the said county or counties for the acquirement of the said roads as aforesaid.

One-third paid
from state ap-
propriation.

Proviso.

2. One-third of the cost of all roads so acquired, together with one-third of the amount expended in improving the same as aforesaid, which improvement shall be made in the manner prescribed for the roads under the aforesaid act, shall be paid for out of the state road appropriation; *provided*, that the amount so paid shall not in one year exceed the amount of forty thousand dollars; if one-third of such cost shall exceed the sum of forty thousand dollars, the said sum of forty thousand dollars shall be appropriated by the governor and state commissioner of public roads among the counties of this state in proportion to the cost of the roads acquired by them for such year as shown by the statement of cost filed in the office of the state commissioner of public roads; the governor and the said commissioner shall, between December fifteenth and thirty-first in each year, certify to the state comptroller the amount to be paid to each county for such year, and the state comptroller shall thereupon draw his warrants in favor of the respective county collectors for the sums certified to as aforesaid upon

the state treasurer, who shall pay the same out of any moneys in the state treasury not otherwise appropriated; *provided further*, that the cost of all turnpike roads acquired under this act in any county in any one year, together with all roads built or repaired, shall not exceed one-half of one per centum of the ratables of such county for the last preceding year. Proviso.

3. On or before August first in each and every year it shall be the duty of the board of chosen freeholders to certify to the county board of assessors, either in the annual tax budget or separately, the two-thirds of the cost of purchasing and improving of all turnpike roads acquired and improved as aforesaid during the year, and the county board of assessors shall include the sum so certified in the county tax assessed for such year, and the same shall be assessed, collected and paid over to the county in the same manner and within the same time that other county taxes are assessed, collected and paid over; if a deficiency shall exist in consequence of the receipt of less than one-third of the cost from the state treasury, the board of chosen freeholders shall have authority to borrow on temporary loans to the amount of such deficiency until the next annual taxes shall be assessed, collected and paid over to the county. Duty of county board of assessors.

Loan to meet deficiency.

4. If the said road shall run through more than one county the petition to the state commissioner of public roads shall be signed by at least two-thirds of the owners of the land and real estate bordering on said road in each county before the governor shall be required to appoint the five commissioners mentioned in the first section of this act; and each of the said counties shall bear the expense of the acquirement of the said road in proportion to the value thereof within the said counties, and all proceedings after the appointment of the said five commissioners that may be required by virtue of this act shall be had separately and independently in each of the said counties. When turnpike in two or more counties.

5. Any road so acquired shall forever thereafter be a free county road, and shall be kept in good order and repair and in the same manner as are other county roads. Maintenance.

6. When the said turnpike roads shall have been so acquired and improved by petition as aforesaid the board of Assessment of benefits.

chosen freeholders shall apply to the circuit court of the county for the appointment of commissioners to estimate and to assess the peculiar benefits conferred by such acquirement and improvement upon the lands and real estate bordering on the road so acquired and improved, of the time and place of which application notices shall be given by ten days' publication in two daily newspapers printed and circulating within the said counties, or by four weeks' publication in two weekly newspapers printed and circulating therein, at which time and place, or such other time and place as the court shall designate, shall, without unnecessary delay, appoint three commissioners, who shall be freeholders and residents of the county in which the application is made, to assess the benefits aforesaid; the said court shall have power to remove any commissioner and appoint another in his place, and also fill any vacancy that may occur in the office of any commissioner at any time.

Manner of assessment.

7. The said commissioners shall then proceed in like manner as the commissioners appointed to assess the benefits conferred by the improvement of the public roads of this state under and by virtue of an act of the legislature entitled "An act to provide for the permanent improvement of the public roads of this state," approved March twenty-second, one thousand eight hundred and ninety-five, and supplements thereto, and the report of the said commissioners when filed and approved shall be a lien upon the properties assessed in like manner, and the said assessment shall be collected in like manner as the assessment in the said act last before mentioned.

Report a lien.

8. This act shall take effect immediately.

Approved March 22, 1901.

VACATION OF TURNPIKE.

SUPPLEMENT.

Approved February 13, 1884.

Sec. 1. That whenever any turnpike company of this state shall execute to any city, township or other municipality of

this state, a deed of cession and transfer of all or any part of any turnpike road lying within the limits of any such city, township or other municipality, and shall have the same duly proven in the manner required for the proof of deeds or conveyances of lands, and shall deliver the same, together with a map or survey of the road, or of the part of road so ceded and transferred to the common council, township committee or other governing board of such city, township or other municipality, and the said common council, township committee or other governing board shall accept the said deed of cession and transfer, by a writing indorsed thereon, the said deed, proof, map or survey and acceptance shall then be recorded in the office of the clerk of the county in which the road so ceded and transferred lies, in the book containing the records of public roads for said county, and after being so recorded shall be filed in the office of the secretary of state; *provided*, that where the charter or act of incorporation of any city or other municipality prescribes the manner in which deeds of dedication of lands for public highways or streets shall be accepted, the proceedings for the acceptance of any deed of cession and transfer by a turnpike company as aforesaid shall, in any such city or other municipality, be the same as is required for the acceptance of a deed of dedication of lands for a public highway or street.

Deed of cession and transfer of turnpike road, how executed and filed.

Proviso.

Sec. 2. That any turnpike company making a cession and transfer of any part of their turnpike road in the manner aforesaid, shall, from the date of filing the deed of cession and transfer in the office of the secretary of state, be released and discharged from all authority and control over the part or parts of their road so ceded and transferred, and from all liability on account of the same, and the same shall thereafter be to all intents and purposes a public road or highway in such city, township or other municipality, and be subject to the same jurisdiction, authority and control by such city, township or other municipality, as it has over other public roads or highways within the limits thereof.

Company released from control, &c., of part of road ceded when deed is filed in office of secretary of state.

An Act authorizing turnpike companies to vacate or dispose of a portion of its road and property.

Approved April 20, 1885.

When turnpike company may vacate or dispose of portion of road.

Sec. 1. That when any turnpike company in this state may deem it advisable to dispose or vacate any portion of their road not in excess of one-half of its entire length, they shall hereby have the power and privilege of so doing at any time when the same may be favored by a vote represented by those owning two-thirds of the capital stock of said company, to be voted at a special meeting of said stockholders called by the officers of said company, and the notice of said meeting being published in at least one newspaper in each county where said road is located, for the space of thirty days, once in each week, said notice to state the time and object of said meeting; the said stockholders may, by a vote represented by those owning two-thirds of the capital stock of said company, authorize and empower their president and secretary to sell or vacate to the freeholders of the county or counties the portion so desired; and if vacated without compensation, a committee of the board of freeholders of the county or counties may view the same and report to the said board upon what terms they have agreed to take said road, and the action of a majority of said board of freeholders in accepting or rejecting said report shall be final.

An Act to authorize turnpike companies to abandon a portion of their roads and property.

Passed June 1, 1886.

Turnpike companies may abandon portion of road.

Sec. 1. That any turnpike company in this state may abandon any portion of their road not exceeding two-thirds of the entire length of the road, when the same may be favored by a vote of those owning a majority of the capital stock of said company; the resolution to abandon a portion of said turnpike shall describe the part so abandoned, and shall be signed by the president and secretary of said turnpike company, duly acknowledged before an officer authorized

to take the acknowledgment of deeds in this state, and shall thereupon be recorded in the office of the clerk of the county wherein such turnpike company is situated; *provided*, that the part of said turnpike so abandoned shall be in all respects in as good repair as when the said company began operating the same.

BROAD TIRES.

CHAPTER 76.

An Act to amend an act entitled "An act to enable township committees to encourage the use of broad tires on wagons and carts by a rebatement of taxes."

1. BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey*, That section one of an act entitled "An act to enable township committees to encourage the use of broad tires on wagons and carts by a rebatement of taxes," approved March sixteenth, one thousand eight hundred and ninety-three, which reads as follows:

1. BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey*, That township committees be and they are hereby authorized, when in their judgment it is for the public good, to pass an ordinance allowing a rebate of taxes for township or road purposes to all owners or possessors of wagons and carts used in said township for transportation of goods, wares, merchandise, produce, passengers, and for general farm, freight and express purposes, having tires of not less than four inches in width; *provided*, the said rebate shall not exceed fifty cents for each wheel in use in any one year," be and the same is hereby amended so as to read as follows:

1. BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey*, That township committees be and they are hereby authorized, when, in their judgment, it is for the public good, to pass an ordinance allowing a rebate of taxes for township or road purposes to all owners or possessors of wagons and carts used in said township for transportation of goods, wares, merchandise, produce, pas-

sengers, and for general farm, freight and express purposes, having tires of not less than four inches in width; *provided*, the said rebate shall not exceed one dollar for each wheel in use in any one year.

2. That this act shall take effect immediately.

Passed March 24, 1896.

CHAPTER 63.

A Supplement to an act entitled "An act to provide for the acquirement of turnpike roads for free public use," approved May eleventh, one thousand eight hundred and ninety-seven.

BE IT ENACTED by the Senate and General Assembly of the State of New Jersey:

Compensation.

1. The pay of the commissioners heretofore or hereafter appointed under said act shall be a sum not exceeding five dollars per day, and necessary expenses not exceeding two dollars per day, for actual number of days employed in such service.

Settlement
when road not
accepted.

2. If the freeholders of the county or counties fail to accept the turnpike roads appraised under the act to which this is a supplement within twelve months after the commission have submitted their award to the state road commissioner, the bill of said commissioners, upon the approval of the state road commissioner and the signature of the governor, shall be presented to the comptroller of the state, who thereupon shall draw his warrant therefor upon the state treasurer, who shall pay the same out of the annual state appropriation for roads.

3. This act shall take effect immediately.

Approved March 20, 1900.

CHAPTER 98.

Further Supplement to an act entitled "An act concerning roads," approved April sixteenth, eighteen hundred and forty-six.

BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey:*

1. The owner or occupant of land abutting on any highway in any township in this state shall, during the month of September of each year, cut and remove all brush, briars and weeds growing in or upon such portion of such highway as his or her lands abut upon, and in case such owner or occupant shall fail to perform the duty imposed hereby, the township committee of the township in which such lands abut as aforesaid shall cause such work to be done and the owner of such lands shall pay the expense thereof, with costs, to be recovered in an action upon contract before any justice of the peace of the county at the suit of such township committee.

Highway must be kept clear of weeds, &c.

2. This act shall take effect immediately.

Approved March 23, 1900.

An Act for the better protection of travelers, pedestrians, vehicles and animals on the public streets and highways.

BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey:*

1. Whoever places upon the surface of any public street, highway or other way customarily and lawfully used for public travel, or upon any sidewalk appurtenant to such way, any broken glass, bottle, metal, loose stones, earthenware, or other substance of a nature likely to cause injury to travelers or pedestrians, or to carriages, bicycles or other vehicles traveling or moving on said way, or which might wound, disable or injure any horse or other animal, or which might injure, cut or puncture any pneumatic tire, shall

Penalty for placing glass, bottles, etc., upon public highways.

forfeit for each offense five dollars, to be sued for and recovered in an action of debt by any person who will sue for the same.

Broken stone of dimension of one inch or more placed on highways to be covered.

2. Any overseer of the highways, committeeman, contractor, or other person whomsoever, who shall place or spread broken stone on any of the highways of this state, for the purpose of improving or repairing the same, shall, if such stone be of the dimension of an inch and one-half or more in diameter, cause the same to be covered with fine stone, earth or screenings, within such period of time as it shall be possible to obtain such fine stone, earth or screenings after said broken stones are spread upon said road, unless prevented by causes beyond his control, under a penalty of twenty dollars for each offense, to be sued for in an action of debt and recovered with costs by any person who shall be injuriously affected by the willful neglect or failure to cover said stone as herein provided.

3. This act shall take effect immediately.

Approved May 12, 1896.

APPENDIX C.

NEW JERSEY.

1. All road taxes are to be paid in money.
2. The office of overseer of highway is abolished.
3. The roads of a township are placed under the management of the township committee, and money may be raised by township bonds for grading, macadamizing and improving the same; bonds to be authorized by vote at the annual town meeting.

4. Under the County act, the Board of Chosen Freeholders of any county may designate certain roads as county roads, and improve the same by the issue of county bonds; townships to pay one-third of the cost.

5. Under the County State Aid law, whenever the owners of two-thirds of the lands fronting on any public road will undertake to pay one-tenth of the cost of improving such road, the Board of Chosen Freeholders may cause such improvements to be made, the State paying one-third of the cost up to, at present, the limit of \$150,000 per year.

Under the Township State Aid law, whenever the owners of two-thirds of the lands fronting on any public road will undertake to pay one-tenth of the cost of improving the same, the township committee may cause such improvements to be made, the State paying one-third of the cost, less the ten per cent., and the township 67 per cent., the township forever keeping the road in repair.

6. Under the act for the acquirement of turnpike roads for free public use, whenever the owners of two-thirds of the land fronting on any turnpike toll-road pray that said road may be acquired for free public use, and that they are willing to pay ten per cent. of the entire cost of such road, the Governor appoints five commissioners to estimate and determine the fair and just value of said road; after having

arrived at such value, if the State Road Commissioner ratifies the same, the board may purchase, the State paying one-third of the cost and the county paying the balance, fifty-seven per cent.

LAYING OUT ROADS.

Receiving many inquiries how to proceed to lay out roads, change location, etc., to save correspondence we give the following quotations from the statutes:

Laying out Roads by Freeholders after General Election.

It shall be lawful for the Board of Chosen Freeholders of any of the several counties of this State when said board deem it for the best interests of such county, to lay out, construct and maintain public roads extending through such county in any direction, to submit, by resolution, the question whether or not such public roads shall be laid out, to the electors of said county, at an election, to be held at the same time and place of holding the general election in and for said county for members of the General Assembly of this State, by the same officers, but in separate ballot-box, and if, at such election, a majority of the electors shall vote "against public roads," nothing in this act shall apply or be effective in said county; but if a majority of the electors vote "in favor of public road," then the board shall proceed as directed by the act entitled "An act to authorize the board of chosen freeholders of any of the several counties of this state to lay out, open, construct, improve and maintain a public road therein," approved April 7th, 1888. P. L. 1888, page 397.

LAYING OUT, VACATING OR ALTERING PUBLIC ROADS BY SURVEYORS OF HIGHWAYS. (Revised Statutes, page 2828-119, Sec. 1.)

That when ten or more persons, being freeholders, shall think a public road necessary, or any public road which hath been or shall be laid out unnecessary, or any alteration in such road necessary in any part of the county in which they

reside, it shall be lawful for the said persons to make application in writing to the inferior court of common pleas of the said county, in open court, having given previous notice for at least ten days of such intended application, and also of the day on which such application is intended to be made, by advertisements under their hands, and set up at three of the most public places in the township in which the said road is proposed to be laid out, vacated or altered, and if there be more townships than one through which the said road may run, by advertisements to be set up at three of the most public places in each township; and the said court, when applied to as aforesaid, on due proof being made that the advertisements have been set up according to law, on which the judgment of the court shall be final and conclusive, are hereby authorized and required to appoint six of the surveyors of the highways of the said county, ever having regard to the appointment of the surveyors of the highways of the township or townships where the said road shall be so applied for to be laid out, vacated or altered; *provided*, that no surveyor shall be appointed through whose land the road may run, or who for any other reason which the court in their discretion shall deem sufficient, think ought not to be appointed; and the said surveyors shall meet at such time and place as the said court shall direct, a copy of which appointment shall be served on each of the said surveyors at least six days prior to the time of their meeting; and two of the said applicants shall, at least twelve days prior to the said time, sign and set up advertisements at three of the most public places in the said township or townships, setting forth the time and place of the meeting of the surveyors agreeably to the directions of the court, and designating the points or places from and to which the said road is proposed to be laid out, vacated or altered. (See Secs. 138 and 168, *post.*)

VACATION AND RELAYING OF PUBLIC ROADS BY FILING CONSENT WITH CLERK AND RECORDING.

138. Sec. 1. That whenever ten or more persons, being freeholders, shall think any alteration of any public road

necessary in any part of the county wherein they reside, by having such road or a portion thereof vacated, and the same relaid or another road substituted therefor, they may make application in writing to the inferior court of common pleas of such county, or to one of the judges thereof, setting forth in writing the road or portion thereof as aforesaid which it is proposed to have vacated, describing the same by courses and distances, and also describing the road as it is to be relaid, or the road which is to be substituted therefor, to which description there shall be attached a map shewing the location of the road or portion of road to be vacated and the road as relaid, or the road which is to be substituted therefor; and if within ten days after such application shall have been made as aforesaid, or if at the time of making such application there shall be presented to said court or judge the consent in writing of the owners of all the lands intersected by such old road or portion thereof proposed to be vacated, and of all the property intersected by the road as proposed to be relaid, or by the road which it is proposed to substitute therefor, and also the written consent of the township committee of the township wherein such road or roads do lie, that said application shall be granted, then it shall be lawful for said court or judge to cause said application, with the accompanying survey, map and return, and the written consents of the owners of lands as aforesaid, and of the township committee, to be filed with the clerk of the county, to be by him recorded in the book of roads for said county; and when said application and other papers shall have been so filed, such old road or portion thereof shall thereupon and thereby be deemed to be vacated, and the road is relaid, or the new road substituted therefor, shall thereupon and thereby be deemed and taken to be a public road.

VACATION OF PUBLIC ROADS BY CONSENT AND FILING WITH
COUNTY CLERK.

186. Sec. 1. That whenever ten or more persons, being freeholders, shall think the vacation of a part of any public road necessary in any part of the county wherein they reside,

they may make application in writing to the inferior court of common pleas of such county, or to one of the judges thereof, setting forth in writing the road or portion thereof which it is proposed to have vacated, describing the same by courses and distances, to which description there shall be attached a map showing the location of the road, or portion thereof to be vacated, and if within ten days after such application shall have been made as aforesaid, or if at the time of making such application, there shall be presented to said court or judge the consent in writing of the owners of all the lands by such old road or portion thereof proposed to be vacated, and also the written consent of the township committee of the township wherein such lands do lie, that such application shall be granted, then it shall be lawful for said court or judge to cause said application, with the accompanying survey, map and return, and the written consents of the owners of lands as aforesaid, and of the township committee, to be filed with the clerk of the county to be by him recorded in the book of roads for said county, and when said application and papers have been so filed, such portion of such old road shall thereupon and thereby be deemed to be vacated; *provided*, that no portion of any old road proposed to be vacated under this act shall exceed one thousand yards in length.



Eagle Rock Avenue, Essex County, before improvement.



Eagle Rock Avenue, Essex County, after improvement. Eight-inch Telford.

APPENDIX D.

Number of tons of stone per mile required to build the following depths and widths.

For the information of intending road builders, we have compiled the following tables, which approximate the number of tons of thoroughly-rolled stone necessary to construct each mile at the designated depths and widths.

The basis is 3,000 tons of loose stone or 3,500 tons of compressed stone for a road one mile long, sixteen feet wide and eight inches deep. A road eight inches deep, when finished, will have required at least ten inches of stone. It should be placed in two layers of five inches each, and each layer rolled down to four inches. Then the application of the three-quarter inch and screenings will bring the road to the prescribed depth; for other thickness the stone should be placed in proportion to the intended finished depths.

An observance of this rule will insure the contract thickness for the roadbed, and save the sometimes necessary expense of resurfacing before acceptance from the contractor.

| A road 8 feet wide and 4 inches deep will require | | | | | | 875 | tons of stone per mile. | | | |
|---|----|---|---|----|---|-----|-------------------------|---|---|---|
| " | 8 | " | " | 6 | " | " | 1,312½ | " | " | " |
| " | 8 | " | " | 8 | " | " | 1,750 | " | " | " |
| " | 8 | " | " | 10 | " | " | 2,187½ | " | " | " |
| " | 8 | " | " | 12 | " | " | 2,625 | " | " | " |
| | | | | | | | | | | |
| " | 9 | " | " | 4 | " | " | 984% | " | " | " |
| " | 9 | " | " | 6 | " | " | 1,476 9-16 | " | " | " |
| " | 9 | " | " | 8 | " | " | 1,968% | " | " | " |
| " | 9 | " | " | 10 | " | " | 2,460 15-16 | " | " | " |
| " | 9 | " | " | 12 | " | " | 2,953½ | " | " | " |
| | | | | | | | | | | |
| " | 10 | " | " | 4 | " | " | 1,093% | " | " | " |
| " | 10 | " | " | 6 | " | " | 1,640% | " | " | " |
| " | 10 | " | " | 8 | " | " | 2,187½ | " | " | " |
| " | 10 | " | " | 10 | " | " | 2,734% | " | " | " |
| " | 10 | " | " | 12 | " | " | 3,281¼ | " | " | " |

A road 11 feet wide and 4 inches deep will require $1,203\frac{1}{8}$ tons of stone per mile.

| | | | | | | | | | | |
|---|----|---|---|----|---|---|---------------------|---|---|---|
| " | 11 | " | " | 6 | " | " | 1,804 11-16 | " | " | " |
| " | 11 | " | " | 8 | " | " | 2,406 $\frac{1}{4}$ | " | " | " |
| " | 11 | " | " | 10 | " | " | 3,007 13-16 | " | " | " |
| " | 11 | " | " | 12 | " | " | 3,609 $\frac{1}{8}$ | " | " | " |
| " | 12 | " | " | 4 | " | " | 1,312 $\frac{1}{2}$ | " | " | " |
| " | 12 | " | " | 6 | " | " | 1,968 $\frac{1}{4}$ | " | " | " |
| " | 12 | " | " | 8 | " | " | 2,625 | " | " | " |
| " | 12 | " | " | 10 | " | " | 3,281 $\frac{1}{4}$ | " | " | " |
| " | 12 | " | " | 12 | " | " | 3,937 $\frac{1}{2}$ | " | " | " |
| " | 13 | " | " | 4 | " | " | 1,421 $\frac{1}{8}$ | " | " | " |
| " | 13 | " | " | 6 | " | " | 2,132 13-16 | " | " | " |
| " | 13 | " | " | 8 | " | " | 2,843 $\frac{1}{4}$ | " | " | " |
| " | 13 | " | " | 10 | " | " | 3,554 11-16 | " | " | " |
| " | 13 | " | " | 12 | " | " | 4,265 $\frac{1}{8}$ | " | " | " |
| " | 14 | " | " | 4 | " | " | 1,531 $\frac{1}{4}$ | " | " | " |
| " | 14 | " | " | 6 | " | " | 2,296 $\frac{1}{8}$ | " | " | " |
| " | 14 | " | " | 8 | " | " | 3,062 $\frac{1}{2}$ | " | " | " |
| " | 14 | " | " | 10 | " | " | 3,828 $\frac{1}{8}$ | " | " | " |
| " | 14 | " | " | 12 | " | " | 4,593 $\frac{1}{4}$ | " | " | " |
| " | 15 | " | " | 4 | " | " | 1,640 $\frac{1}{8}$ | " | " | " |
| " | 15 | " | " | 6 | " | " | 2,460 15-16 | " | " | " |
| " | 15 | " | " | 8 | " | " | 3,281 $\frac{1}{4}$ | " | " | " |
| " | 15 | " | " | 10 | " | " | 4,101 9-16 | " | " | " |
| " | 15 | " | " | 12 | " | " | 4,921 $\frac{1}{8}$ | " | " | " |
| " | 16 | " | " | 4 | " | " | 1,750 | " | " | " |
| " | 16 | " | " | 6 | " | " | 2,625 | " | " | " |
| " | 16 | " | " | 8 | " | " | 3,500 | " | " | " |
| " | 16 | " | " | 10 | " | " | 4,375 | " | " | " |
| " | 16 | " | " | 12 | " | " | 5,250 | " | " | " |
| " | 17 | " | " | 4 | " | " | 1,859 $\frac{1}{8}$ | " | " | " |
| " | 17 | " | " | 6 | " | " | 2,789 1-16 | " | " | " |
| " | 17 | " | " | 8 | " | " | 3,718 $\frac{1}{4}$ | " | " | " |
| " | 17 | " | " | 10 | " | " | 4,648 7-16 | " | " | " |
| " | 17 | " | " | 12 | " | " | 5,578 $\frac{1}{8}$ | " | " | " |
| " | 18 | " | " | 4 | " | " | 1,968 $\frac{1}{4}$ | " | " | " |
| " | 18 | " | " | 6 | " | " | 2,953 $\frac{1}{8}$ | " | " | " |
| " | 18 | " | " | 8 | " | " | 3,937 $\frac{1}{2}$ | " | " | " |
| " | 18 | " | " | 10 | " | " | 4,921 $\frac{1}{8}$ | " | " | " |
| " | 18 | " | " | 12 | " | " | 5,906 $\frac{1}{4}$ | " | " | " |
| " | 19 | " | " | 4 | " | " | 2,078 $\frac{1}{8}$ | " | " | " |
| " | 19 | " | " | 6 | " | " | 3,117 3-16 | " | " | " |
| " | 19 | " | " | 8 | " | " | 4,156 $\frac{1}{4}$ | " | " | " |
| " | 19 | " | " | 10 | " | " | 5,195 5-16 | " | " | " |
| " | 19 | " | " | 12 | " | " | 6,234 $\frac{1}{8}$ | " | " | " |
| " | 20 | " | " | 4 | " | " | 2,187 $\frac{1}{2}$ | " | " | " |
| " | 20 | " | " | 6 | " | " | 3,281 $\frac{1}{4}$ | " | " | " |
| " | 20 | " | " | 8 | " | " | 4,375 | " | " | " |
| " | 20 | " | " | 10 | " | " | 5,468 $\frac{1}{4}$ | " | " | " |
| " | 20 | " | " | 12 | " | " | 6,562 $\frac{1}{2}$ | " | " | " |

TABLES.

As many persons interested in the construction of stone roads are asking questions about their cost, we enclose a table to show at a glance the number of square yards at different widths in a mile of road; also the cost at different widths and various prices per square yard. Any variations from these prices can be quickly ascertained by adding, subtracting, multiplying and dividing for a less or greater width. For example, a road eight feet wide has 4,693 1-3 square yards in one mile. To obtain the number of square yards in a road having a width of nine feet, add one-eighth to the foregoing figures, and in one having a width of seven feet, subtract one-eighth; in one of twice the width given in the table multiply by two.

SQUARE YARDS IN ONE MILE OF

| | |
|---|-------------------------|
| 8 feet in width..... | 4,693 1-3 square yards. |
| 10 " | 5,866 2-3 " |
| 12 " | 7,040 " |
| 14 " | 8,213 1-3 " |
| 16 " | 9,386 2-3 " |
| 18 " | 10,560 " |
| 8 feet wide, or 4,693 1-3 square yards, at 25c. per yard..... | \$1,173 33 1-3 |
| 10 " 5,866 2-3 " 25c. " | 1,466 66 2-3 |
| 12 " 7,040 " 25c. " | 1,760 00 |
| 14 " 8,213 1-3 " 25c. " | 2,053 33 1-3 |
| 16 " 9,386 2-3 " 25c. " | 2,346 66 2-3 |
| 18 " 10,560 " 25c. " | 2,640 00 |
| 8 " 4,693 1-3 " 30c. " | \$1,408 00 |
| 10 " 5,866 2-3 " 30c. " | 1,760 00 |
| 12 " 7,040 " 30c. " | 2,112 00 |
| 14 " 8,213 1-3 " 30c. " | 2,464 00 |
| 16 " 9,386 2-3 " 30c. " | 2,816 00 |
| 18 " 10,560 " 30c. " | 3,168 00 |
| 8 " 4,693 1-3 " 35c. " | \$1,642 66 2-3 |
| 10 " 5,866 2-3 " 35c. " | 2,053 33 1-3 |
| 12 " 7,040 " 35c. " | 2,464 00 |
| 14 " 8,213 1-3 " 35c. " | 2,874 66 2-3 |
| 16 " 9,386 2-3 " 35c. " | 3,285 33 1-3 |
| 18 " 10,560 " 35c. " | 3,696 00 |
| 8 " 4,693 1-3 " 40c. " | \$1,877 33 1-3 |
| 10 " 5,866 2-3 " 40c. " | 2,346 66 2-3 |
| 12 " 7,040 " 40c. " | 2,816 00 |
| 14 " 8,213 1-3 " 40c. " | 3,285 33 1-3 |
| 16 " 9,386 2-3 " 40c. " | 3,754 66 2-3 |
| 18 " 10,560 " 40c. " | 4,224 00 |

| | | | | | | | |
|---|---|-----------|---|------|---|-------|----------------|
| 8 feet wide, or 4,693 1-3 square yards, at 45c. per yard..... | | | | | | | \$2,112 00 |
| 10 | " | 5,866 2-3 | " | 45c. | " | ..... | 2,640 00 |
| 12 | " | 7,040 | " | 45c. | " | ..... | 3,168 00 |
| 14 | " | 8,213 1-3 | " | 45c. | " | ..... | 3,696 00 |
| 16 | " | 9,386 2-3 | " | 45c. | " | ..... | 4,224 00 |
| 18 | " | 10,560 | " | 45c. | " | ..... | 4,752 00 |
| 8 " 4,693 1-3 " 50c. " | | | | | | | \$2,346 66 2-3 |
| 10 | " | 5,866 2-3 | " | 50c. | " | ..... | 2,933 33 1-3 |
| 12 | " | 7,040 | " | 50c. | " | ..... | 3,520 00 |
| 14 | " | 8,213 1-3 | " | 50c. | " | ..... | 4,106 66 2-3 |
| 16 | " | 9,386 2-3 | " | 50c. | " | ..... | 4,693 33 1-3 |
| 18 | " | 10,560 | " | 50c. | " | ..... | 5,280 00 |
| 8 " 4,693 1-3 " 55c. " | | | | | | | \$2,581 33 1-3 |
| 10 | " | 5,866 2-3 | " | 55c. | " | ..... | 3,226 66 2-3 |
| 12 | " | 7,040 | " | 55c. | " | ..... | 3,872 00 |
| 14 | " | 8,213 1-3 | " | 55c. | " | ..... | 4,517 33 1-3 |
| 16 | " | 9,386 2-3 | " | 55c. | " | ..... | 5,162 66 2-3 |
| 18 | " | 10,560 | " | 55c. | " | ..... | 5,808 00 |
| 8 " 4,693 1-3 " 60c. " | | | | | | | \$2,816 00 |
| 10 | " | 5,866 2-3 | " | 60c. | " | ..... | 3,520 00 |
| 12 | " | 7,040 | " | 60c. | " | ..... | 4,224 00 |
| 14 | " | 8,213 1-3 | " | 60c. | " | ..... | 4,928 00 |
| 16 | " | 9,386 2-3 | " | 60c. | " | ..... | 5,632 00 |
| 18 | " | 10,560 | " | 60c. | " | ..... | 6,336 00 |
| 8 " 4,693 1-3 " 65c. " | | | | | | | \$3,050 66 2-3 |
| 10 | " | 5,866 2-3 | " | 65c. | " | ..... | 3,813 33 1-3 |
| 12 | " | 7,040 | " | 65c. | " | ..... | 4,576 00 |
| 14 | " | 8,213 1-3 | " | 65c. | " | ..... | 5,338 66 2-3 |
| 16 | " | 9,386 2-3 | " | 65c. | " | ..... | 6,101 33 1-3 |
| 18 | " | 10,560 | " | 65c. | " | ..... | 6,864 00 |
| 8 " 4,693 1-3 " 70c. " | | | | | | | \$3,285 33 1-3 |
| 10 | " | 5,866 2-3 | " | 70c. | " | ..... | 4,106 66 2-3 |
| 12 | " | 7,040 | " | 70c. | " | ..... | 4,928 00 |
| 14 | " | 8,213 1-3 | " | 70c. | " | ..... | 5,749 33 1-3 |
| 16 | " | 9,386 2-3 | " | 70c. | " | ..... | 6,570 66 2-3 |
| 18 | " | 10,560 | " | 70c. | " | ..... | 7,392 00 |
| 8 " 4,693 1-3 " 75c. " | | | | | | | \$3,520 00 |
| 10 | " | 5,866 2-3 | " | 75c. | " | ..... | 4,400 00 |
| 12 | " | 7,040 | " | 75c. | " | ..... | 5,280 00 |
| 14 | " | 8,213 1-3 | " | 75c. | " | ..... | 6,160 00 |
| 16 | " | 9,386 2-3 | " | 75c. | " | ..... | 7,040 00 |
| 18 | " | 10,560 | " | 75c. | " | ..... | 7,920 00 |
| 8 " 4,693 1-3 " 80c. " | | | | | | | \$3,754 66 2-3 |
| 10 | " | 5,866 2-3 | " | 80c. | " | ..... | 4,693 33 1-3 |
| 12 | " | 7,040 | " | 80c. | " | ..... | 5,632 00 |
| 14 | " | 8,213 1-3 | " | 80c. | " | ..... | 6,570 66 2-3 |
| 16 | " | 9,386 2-3 | " | 80c. | " | ..... | 7,509 33 1-3 |
| 18 | " | 10,560 | " | 80c. | " | ..... | 8,448 00 |

| | | | | | | |
|---|---|-----------|---|--------|---|----------------|
| 8 feet wide, or 4,693 1-3 square yards, at 85c. per yard..... | | | | | | \$3,989 33 1-3 |
| 10 | " | 5,866 2-3 | " | 85c. | " | 4,986 66 2-3 |
| 12 | " | 7,040 | " | 85c. | " | 5,984 00 |
| 14 | " | 8,213 1-3 | " | 85c. | " | 6,981 33 1-3 |
| 16 | " | 9,386 2-3 | " | 85c. | " | 7,978 66 2-3 |
| 18 | " | 10,560 | " | 85c. | " | 8,976 00 |
| | | | | | | |
| 8 | " | 4,693 1-3 | " | 90c. | " | \$4,224 00 |
| 10 | " | 5,866 2-3 | " | 90c. | " | 5,280 00 |
| 12 | " | 7,040 | " | 90c. | " | 6,336 00 |
| 14 | " | 8,213 1-3 | " | 90c. | " | 7,392 00 |
| 16 | " | 9,386 2-3 | " | 90c. | " | 8,448 00 |
| 18 | " | 10,560 | " | 90c. | " | 9,504 00 |
| | | | | | | |
| 8 | " | 4,693 1-3 | " | 95c. | " | \$4,458 66 2-3 |
| 10 | " | 5,866 2-3 | " | 95c. | " | 5,573 33 1-3 |
| 12 | " | 7,040 | " | 95c. | " | 6,688 00 |
| 14 | " | 8,213 1-3 | " | 95c. | " | 7,802 66 2-3 |
| 16 | " | 9,386 2-3 | " | 95c. | " | 8,917 33 1-3 |
| 18 | " | 10,560 | " | 95c. | " | 10,032 00 |
| | | | | | | |
| 8 | " | 4,693 1-3 | " | \$1 00 | " | \$4,693 33 1-3 |
| 10 | " | 5,866 2-3 | " | 1 00 | " | 5,866 66 2-3 |
| 12 | " | 7,040 | " | 1 00 | " | 7,040 00 |
| 14 | " | 8,213 1-3 | " | 1 00 | " | 8,213 33 1-3 |
| 16 | " | 9,386 2-3 | " | 1 00 | " | 9,386 66 2-3 |
| 18 | " | 10,560 | " | 1 00 | " | 10,560 00 |

TABLE FOR GRAVEL.

Table showing number of cubic yards of gravel required in the construction of one mile of gravel road, of widths varying from 6 feet to 20 feet, and depth from 6 to 12 inches. The within quantities should be multiplied by $\frac{1}{3}$ to give the number of cubic yards of loose gravel required to make the within depths of compact gravel.

| ONE MILE IN LENGTH. | Width. Number of feet in | Number of cubic yards in road | | | | | | | | | |
|---------------------|-----------------------------|---|---|---|--|---|---|---|-------|-------|-------|
| | | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| One mile.... | 6 ft. wide. | 5864 | 6844 | 7824 | 8804 | 9774 | 10754 | 11734 | 12714 | 13684 | 14664 |
| " | 7 " | 6844 | 7914 | 8994 | 10074 | 11154 | 12234 | 13314 | 14394 | 15474 | 16554 |
| " | 8 " | 7824 | 8994 | 10164 | 11334 | 12504 | 13674 | 14844 | 16014 | 17184 | 18354 |
| " | 9 " | 8804 | 10074 | 11334 | 12594 | 13854 | 15114 | 16374 | 17634 | 18894 | 20154 |
| " | 10 " | 9774 | 11154 | 12504 | 13854 | 15114 | 16374 | 17634 | 18894 | 20154 | 21414 |
| " | 11 " | 10754 | 12234 | 13674 | 15114 | 16374 | 17634 | 18894 | 20154 | 21414 | 22674 |
| " | 12 " | 11734 | 13314 | 14844 | 16374 | 17634 | 18894 | 20154 | 21414 | 22674 | 23934 |
| " | 13 " | 12714 | 14394 | 16014 | 17634 | 18894 | 20154 | 21414 | 22674 | 23934 | 25194 |
| " | 14 " | 13684 | 15474 | 17184 | 18894 | 20154 | 21414 | 22674 | 23934 | 25194 | 26454 |
| " | 15 " | 14664 | 16554 | 18354 | 20154 | 21414 | 22674 | 23934 | 25194 | 26454 | 27714 |
| " | 16 " | 15644 | 17634 | 19444 | 21414 | 22674 | 23934 | 25194 | 26454 | 27714 | 28974 |
| " | 17 " | 16624 | 18614 | 20504 | 22484 | 23934 | 25194 | 26454 | 27714 | 28974 | 30234 |
| " | 18 " | 17604 | 19594 | 21474 | 23454 | 25194 | 26454 | 27714 | 28974 | 30234 | 31494 |
| " | 19 " | 18574 | 20564 | 22444 | 24424 | 26454 | 27714 | 28974 | 30234 | 31494 | 32754 |
| " | 20 " | 19554 | 21544 | 23414 | 25394 | 27424 | 28974 | 30234 | 31494 | 32754 | 34014 |
| | | Number of cubic yards in road 6 inches deep. | Number of cubic yards in road 7 inches deep. | Number of cubic yards in road 8 inches deep. | Number of cubic yards in road 9 inches deep. | Number of cubic yards in road 10 inches deep. | Number of cubic yards in road 11 inches deep. | Number of cubic yards in road 12 inches deep. | | | |
| | | 1,173 | 1,368 | 1,564 | 1,760 | 1,955 | 2,151 | 2,346 | 2,542 | 2,737 | 2,932 |
| | | 1,075 | 1,254 | 1,431 | 1,618 | 1,792 | 1,971 | 2,151 | 2,330 | 2,509 | 2,688 |
| | | 977 | 1,140 | 1,303 | 1,466 | 1,629 | 1,792 | 1,955 | 2,118 | 2,281 | 2,444 |
| | | 880 | 1,026 | 1,173 | 1,320 | 1,466 | 1,613 | 1,760 | 1,906 | 2,053 | 2,200 |
| | | 782 | 912 | 1,042 | 1,173 | 1,303 | 1,434 | 1,564 | 1,694 | 1,825 | 1,955 |
| | | 684 | 791 | 899 | 1,007 | 1,115 | 1,223 | 1,331 | 1,439 | 1,547 | 1,655 |
| | | 586 | 684 | 782 | 880 | 977 | 1,075 | 1,173 | 1,271 | 1,368 | 1,466 |
| | | Number of cubic yards in road 12 inches deep. | Number of cubic yards in road 11 inches deep. | Number of cubic yards in road 10 inches deep. | Number of cubic yards in road 9 inches deep. | Number of cubic yards in road 8 inches deep. | Number of cubic yards in road 7 inches deep. | Number of cubic yards in road 6 inches deep. | | | |
| | | 3,911 | 3,715 | 3,520 | 3,324 | 3,129 | 2,932 | 2,737 | 2,542 | 2,346 | 2,151 |
| | | 3,585 | 3,401 | 3,226 | 3,041 | 2,866 | 2,688 | 2,509 | 2,330 | 2,151 | 1,971 |
| | | 3,259 | 3,096 | 2,933 | 2,770 | 2,607 | 2,444 | 2,281 | 2,118 | 1,955 | 1,792 |
| | | 2,932 | 2,786 | 2,640 | 2,493 | 2,346 | 2,199 | 2,053 | 1,906 | 1,760 | 1,613 |
| | | 2,607 | 2,477 | 2,346 | 2,215 | 2,084 | 1,955 | 1,825 | 1,694 | 1,564 | 1,434 |
| | | 2,281 | 2,167 | 2,053 | 1,919 | 1,785 | 1,655 | 1,521 | 1,389 | 1,259 | 1,129 |
| | | 1,955 | 1,857 | 1,760 | 1,662 | 1,564 | 1,466 | 1,368 | 1,271 | 1,173 | 1,075 |
| | | 1,629 | 1,547 | 1,466 | 1,385 | 1,303 | 1,223 | 1,140 | 1,058 | 977 | 896 |
| | | 1,303 | 1,223 | 1,140 | 1,058 | 977 | 896 | 814 | 732 | 650 | 568 |
| | | 1,075 | 1,007 | 935 | 863 | 791 | 719 | 647 | 575 | 503 | 431 |
| | | 847 | 785 | 723 | 661 | 599 | 537 | 475 | 413 | 351 | 289 |
| | | 619 | 567 | 515 | 463 | 411 | 359 | 307 | 255 | 203 | 151 |
| | | 391 | 349 | 307 | 265 | 223 | 181 | 139 | 97 | 55 | 13 |

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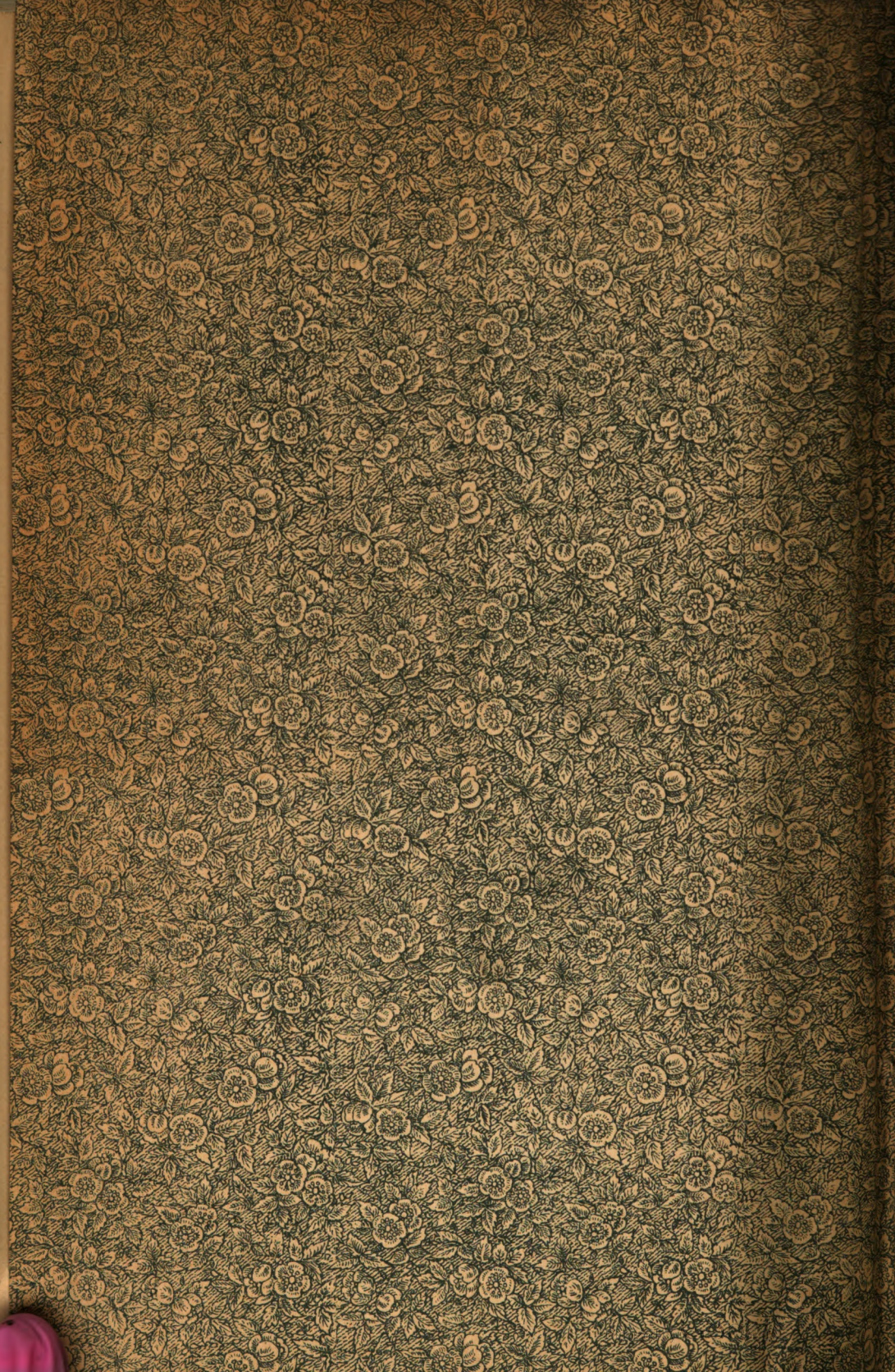
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